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Vol. 19. No. 5 MAY, 1921

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER

ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post-office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK

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ELECTRO-PLATERS REVIEW.

Vol. 19 NEW YORK, MAY, 1921 No. 5

Iron-Pot Melting Practice for Aluminum Alloys[1]

A Series of Articles Giving a Complete Survey of Present Day Methods in General and a Detailed Investigation of Iron-Pot Practice in Particular. Part 1.

By ROBERT J. ANDERSON[2]

INTRODUCTION.

For melting light aluminum alloys in foundry practice prior to pouring sand castings, a variety of different types of furnaces are used industrially. Thus, at the present time, aluminum alloys are melted in pit furnaces using a plumbago crucible; in stationary and tilting crucible furnaces; in stationary and tilting iron-pot furnaces; in egg-shaped and barrel-shaped open-flame furnaces (the former are tilting and the latter generally stationary, although the barrel-shaped type may also be tilting or rotating and tilting); in reverberatory furnaces, and in some types of electric furnaces. Iron-pot furnaces are, however, employed extensively in foundry practice for aluminum alloys in the United States, and this type of furnace is favored by many foundrymen. Thus, taking the cases of 60 representative foundries reporting to the Bureau of Mines in connection with a recent investigation of aluminum and aluminum-alloy melting practice, 16 reported the use of stationary iron-pot furnaces, and two used tilting iron-pot furnaces. At the present time, the trend in new installations is toward the employment of reverberatory or barrel-shaped open-flame furnaces, especially in large foundries, but under certain conditions it appears that the iron-pot furnace is the preferable type. In any event, the iron-pot furnace is a popular commercial furnace, and it will probably be used for a long time to come for melting aluminum alloys.

Not much published information has so far appeared with regard to the melting of aluminum and its light alloys, and in the present series of articles it is the writer's intention to discuss iron-pot furnace practice as applied to the melting of aluminum alloys for foundry work. This contribution is based in part upon a recent investigation made by the Bureau of Mines of aluminum and aluminum-alloy melting practice in the United States, and it was decided to discuss iron-pot furnaces here rather than any of the several other types used commercially because the iron-pot furnace has been, and is, used by many important foundries, and because a relatively large percentage of the aluminum alloys poured into sand castings today is melted in these furnaces. This series of articles is issued as a contribution to the literature of the metallurgy of aluminum, and it is hoped that the information given will be found of interest and value to foundrymen and melters.

ACKNOWLEDGMENTS

The writer is indebted to a number of foundry superintendents and metallurgists in the light alloy industry for certain data supplied as to the operating details of furnace installations. Some data have also been kindly supplied by furnace makers. Specific acknowledgment can not be given of all the sources of information since much of the data made available are confidential as to source.

IRON-POT FURNACES IN GENERAL.

Iron-pot furnaces are built in two general designs: (1) stationary iron pots, and (2) tilting iron pots. There are several different commercial designs, but for the purposes of the present discussion a classification of iron-pot furnaces may be given as follows:

A. Stationary iron-pot furnaces.
   1. Single unit, circular pot.
   2. Single unit, rectangular pot.
   3. Multiple unit, circular pot.
   4. Multiple unit, rectangular pot.
   5. Battery of single units, circular pot.
   6. Battery of single units, rectangular pot.

B. Tilting iron-pot furnaces.
   1. Single unit, circular pot.
   2. Battery of single units, circular pot.

A few words of explanation are in order in connection with the above classification. As a rule, small single-unit stationary iron-pot furnaces are preferred for use in foundries where the output of aluminum alloys is not large. The stationary furnaces may use either circular or rectangular iron pots, but the former are most commonly employed. In large foundries a battery of ten or more—in some foundries as many as forty—furnaces is installed. Single-unit furnaces possess the advantage that an installation can be increased in size by simply adding additional units. In regard to multiple-unit stationary furnaces, these are built by placing two or more iron pots in a furnace shell. Two or three pots form the usual construction. The stationary furnaces are used more widely than the tilting type in the United States, and there are certain inherent advantages in each type. Iron-

[1]Published by permission of the Director, U. S. Bureau of Mines.
[2]Metallurgist, U. S. Bureau of Mines, Experiment Sta., Pittsburgh, Pa.

pot furnaces of various designs are built and placed upon the market for sale by furnace makers, and in some foundries the furnaces are built by labor available in the plant. The general features of the construction of the various designs of iron-pot furnaces used in the United States are essentially the same, although particular features are emphasized by different makers. The construction details of some typical furnaces will be dealt with at some length in later paragraphs of these articles.

The iron-pot furnace as used for aluminum alloys in foundry practice is really an adaptation of the so-called "soft-metal melting kettle" which is employed extensively for melting babbitts, solders and various so-called white metals and soft metals, and it is practically the only type of furnace used for aluminum alloys which is not also employed in brass and bronze practice. In a general way, it may be said that aluminum alloys and brass and its related alloys are melted in the same types of furnaces, with the exception of the iron-pot furnace which is employed extensively for the former, but not at all for the latter. Iron-pot furnaces are run either open or closed, i.e., without covers or with covers. Covers are not so often used on the tilting type, nor in the case of large installations of the stationary type. The small single-unit stationary furnaces are generally run with covers. In the iron-pot furnace, the pot is heated over its exterior surface by the combustion of fuel in the space between the pot and the furnace shell, and there is practically no opportunity for the products of combustion to come into contact with the metal during melting. In open-flame furnaces, in pit furnaces, and in crucible furnaces, the flames or products of combustion have ample opportunity to come into contact with the metal.

It has been stated that iron-pot furnaces are used extensively in foundry practice for melting aluminum alloys prior to pouring sand castings. These furnaces, it may be added, are also used for melting aluminum alloys for other purposes. Thus, they are employed for making up alloys prior to casting into pigs in die-casting practice, and small single-unit stationary furnaces are the preferred type in permanent-mold casting practice, e. g., in the production of pistons. The stationary furnaces are also employed for running down aluminum-alloy borings, drosses, and related scraps in the manufacture of secondary aluminum-alloy pig.

IRON-POT MELTING PRACTICE ON THE BASIS OF THE PERIODICAL LITERATURE.

A careful examination of the periodical literature has not brought to light any published accounts of any especially noteworthy studies of the operating details and performance of iron-pot furnaces for aluminum alloys. Some few accounts of iron-pot furnace installations have appeared in the technical press, however, and a few brief notes and abstracts from published articles may be included here. Certain of the information given in the literature is of no value whatever because detailed data are not supplied. In the subject matter of papers published hitherto, there has been a lack of detailed information with regard to the following items which are of first rate importance: (1) the make-up of the melting charge, i. e., the kind of materials used and the alloy being melted; (2) operating conditions of the furnace; (3) dross loss; and (4) fuel consumption.

GENERAL INFORMATION

It is stated in many places in the trade journals and elsewhere that when aluminum and its light alloys are melted they absorb nitrogen and other gases and that the chief difficulty in melting lies in overheating. As has been pointed out above, aluminum alloys have been melted in all types of furnaces used for brass and related nonferrous alloys, with the exception of iron-pot furnaces, and Krom[1] has given a good review of the principal types of commercial furnaces. In Bulletin 73 of the Bureau of Mines, Gillett[2] has discussed the various types of furnaces used in brass practice; many of the furnaces described have been employed for melting aluminum alloys in foundry practice. Collins[3] states that in melting aluminum alloys in foundry practice the metal should be heated to a temperature higher than is necessary to pour the castings, allow for a drop in temperature in dipping and transferring to the pots with which it is carried to the molding floor. A temperature of 816° C. (1500° F.) will usually take care of this. As soon as the metal is sufficiently hot it should be thoroughly stirred, then dipped out, and carried to the molds. The metal in the furnace should be under pyrometric control and also should be kept covered during melting. In order to prevent overheating the metal and to transport it to the floor sufficiently hot for pouring, arrangements should be made for pre-heating the dipping and pouring ladles.

This series will be continued in our subsequent issues.—Ed.

The Aluminum Producers of the World

The following is a list of the aluminum producers of the world and the addresses of their head offices. A number of the producers have several works, some as many as half a dozen.

COMPANY	HEAD OFFICE
Aluminum Company of America	Pittsburgh, Pa.
Northern Aluminum Company	Shawinigan Falls, Canada
British Aluminium Company, Ltd	London, England
Aluminium Industrie A. G.	Neuhausen, Switzerland
Societe Electrometallurgique	Froges, France
Francaise Electrometallurgique	Froges, France
Compagnie d'Alais et de la	Salindres, France
Camargue d'Alais et de la	Salindres, France
Societe des Forces Motrices	France
Usines de l'Arve	France
Societe des Pyrenees Electrochimiques	Venthon, France
Societe Electro-Metallurgique du Sud Est	Venthon, France,
Societe d'Electrochemie	France
Societa Italiana per la Fabbricazione dell' Aluminio,	Bussi, Italy
Vereinigte Aluminiumwerke A. G.	Lauta, Germany
Erftwerke A. G.	Lauta, Germany
Innwerke A. G.	Lauta, Germany
Norsk Hydro-Elektrisk Kvaelstof A. S.	Christiania, Norway
Norsk Aluminium A. S.	Hoyangfaldene, Norway

An interesting fact is that the whole aluminum industry is a development of the last quarter of a century.

Foundry Mixtures

Crank Pins

Copper	10 lbs. 10 oz.
Tin	1½ "

Die Metal

Copper	1 lb.
Tin	2½ oz.
Zinc	¼ "
Lead	⅛ "

Small Gear

Copper	84 lbs.
Tin	12 "
Zinc	4 "

Gun Metal

Copper	5 lbs.
Tin	1 "
Zinc	½ oz.
Lead	½ "

Crank Keys

Copper	85 lbs.
Tin	15 "

Large Gear

Copper	89 lbs.
Tin	8½ "
Zinc	2½ "

[1]Krom, L. J., The development of melting furnaces. The Metal Ind., vol. 7, 1909, pp. 287-289; 324-326; 358-361; 404-406; 436-440; and vol. 8, 1910, pp. 80-81.

[2]Gillett H. W., Brass-furnace practice in the United States, Bureau of Mines Bull. 73, second ed., June, 1916.

[3]Collins, J. W., Suggestions for making aluminum castings. The Foundry, vol. 42, 1914, pp. 67-68.

A New Indirect Arc Furnace

A Description of a Three-Phase, Gyrating Electric Furnace for Metals

A number of single-phase and two-phase electric brass furnaces have been designed and put on the market, some of which seemed to solve the question of melting these metals electrically with a considerable degree of success. Many metallurgists believe, however, that the three-phase unit has proven to be the most satisfactory and highly efficient furnace in the electric steel industry, and some have harbored an inward conviction that ultimately the three-phase unit would also take the leading position in the melting of brass and other non-ferrous metals.

Actuated by the above convictions and objects, the Volta Manufacturing Company, Limited, of Welland, Ont., have developed and during the past year placed on the market a three-phase electric furnace which they claim is superior to anything heretofore developed for this class of work.

GENERAL DESCRIPTION

As will be seen by the illustrations of the furnace, the shell is of a cylindrical design and is operated in an upright position—similar to the electric steel furnace. The furnace is lined with refractory brick and the roof is also made of refractory material. It is provided with a cast iron base, equipped with a motor-driven set of gears and rollers which give to the furnace a natural gyratory movement.

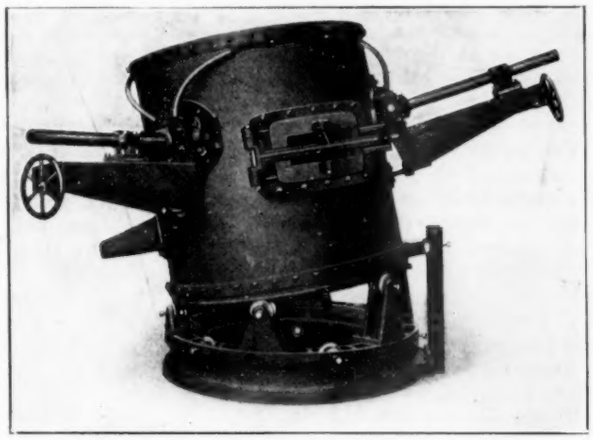


FIG. 1. SIDE VIEW OF VOLTA THREE-PHASE ELECTRIC FURNACE.

The equipment throughout is of the most simple design, consisting, briefly, of the transformer, switchboard and instruments, and furnace with gyrating mechanism, complete. The transformer supplied with each furnace is three-phase, the voltage, cycles and capacity being regulated to meet the customer's power characteristics and the capacity of the furnace being installed.

ELECTRICAL FEATURES

One of the strong features of this furnace, and one that must appeal to central station-men, is the fact that it is a three-phase unit—meaning a balanced load on their three-phase power systems, which naturally will allow of the power companies giving a better power rate to the users. It is quite generally known that many of the power companies, having a limited amount of power on their lines, will not permit the operation of single phase units except at a very high power rate. On account of using three-phase current on this furnace, the surges—so very apparent in single phase furnaces—have, to a great extent, been obviated—in fact, it is claimed to be perfectly feasible to operate this furnace on a 25-cycle power line with only a 4 per cent reaction in the transformer, the result being a power factor around 92.

MECHANICAL FEATURES

As can be seen by the illustration, the three electrodes enter the furnace through the side of the shell at points 120 degrees apart. The graphite electrodes are supported by heavy arms, which are provided with guides to take the electrode holders. The construction of these arms provides a substantially insulated sleeve, around the electrodes, which is kept cool by means of a water-cooled collar. This insulated sleeve is so designed that any zinc-oxides which may form on the electrodes will not interfere with the movement of the electrodes through these sleeves. The water cooled collar is in the form of a ball joint, and with this arrangement the position of the electrodes can be changed relative to each other—at the same time making provision so that they can be raised or lowered in respect to the metal bath.

On account of having three electrodes, it is not necessary to maintain the same degree of perfect alignment of the electrodes as is necessary with the single phase unit in order to maintain a perfect control of the arc, and, inasmuch as the arcing takes place between three electrodes, the arcing should be distributed over a much wider area than in the single phase two-electrode furnace.

The electrode holders move in the guides provided in the cast iron arms. This movement is obtained by means of heavy screws, actuated either by hand or by a simple system of motor driven gearing. The charge at no time is above the electrodes and it is not necessary to withdraw the electrodes during the charging or pouring periods. This eliminates any chance of electrode breakage due to heavy scrap falling on them; gives a longer life to the electrodes, and also eliminates the expense and loss of time ordinarily incurred in removing and replacing broken electrodes. Furthermore, the furnace can be started gyrating from the minute the current is put on in the furnace.

The roof of the furnace is independent of the shell. This permits of the relative height of the roof to the bath being designed in such a manner as to insure the best melting conditions as well as the least possible fusing of the refractories. A vent hole, with a light cover, is provided in the roof of the furnace, which allows of operating under tight conditions with perfect safety, and which, in turn, correspondingly reduces the metallic losses. Should gases, formed from the use of oily or dirty material in the charge, reach a certain pressure they are allowed to escape through this vent in the roof.

It is stated that in actual practice it was found that the heat from the arc was sprayed down and over the metal in such a manner as to heat the whole surface of the metal evenly. That heat which was radiated against the roof—which is specially designed—was immediately reflected down on the metal and not on the furnace walls.

MIXING THE METAL

It is of great importance, in the melting of brass, that the heat applied above the metal should be diffused through the metal as quickly as possible. The heat conductivity of the charge is not sufficient for this, and mechanical mixing has to be resorted to. In this furnace the mixing movement of the furnace is in the form of a

gyratory motion, which, it has been found, is a very efficient one on account of the fact that in one complete revolution of the gyrating apparatus the depth of the metal in any given part of the furnace is changed from the minimum to the maximum depth.

This gyrating movement is very simple, being accomplished by means of a ring revolving on rollers on top of which ring is mounted another set of rollers at different heights so as to incline the furnace. This gyrating mechanism is motor driven, and, as the cast iron ring and rollers beneath the furnace revolve, the furnace itself keeps continually raising and lowering in a gyrating manner. It is claimed that superheating of the metal is practically eliminated. The action is such that there is a continual changing in the depth of the metal bath, since, when in motion, that part of the furnace which is highest will have only a small depth of metal while the metal in that part of the furnace which is lowest will be considerably deeper, and since during one complete revolution of the rollers and gearing the position of the furnace, at any given point, is changed from a maximum to a minimum height.

POURING

When the metal is ready to pour, the operating motor is stopped when the spout on the furnace has attained its highest position, the plug is then drawn and the motor started again and the spout lowered so that the metal will flow in any desired quantity, as it is only necessary to reverse the motor—by means of the control provided—and the mouthpiece raised again. Ingots can be freely

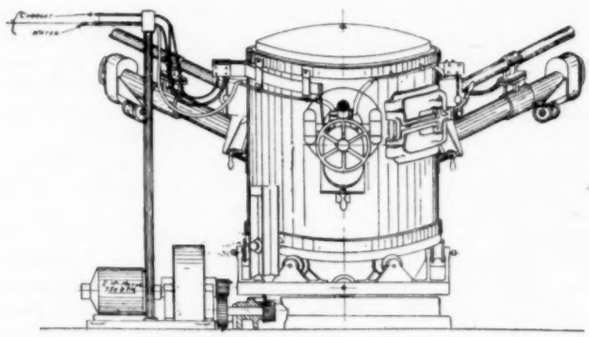


FIG. 2. SKETCH SHOWING ELECTRICAL CONNECTIONS AND GYRATION DRIVE.

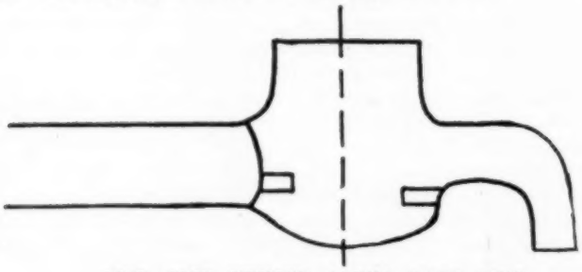
handled in this manner, as the metal stream varies but little, as regards the position of the flowing stream, in the different positions of the mouthpiece.

At the present time this furnace is made in standard sizes of 1/8, 1/4, 1/2 and 1 ton capacity.

PLUMBING SUPPLIES

Q.—Will you please give us information about a good core mixture for brass plumbing supplies such as bibbs and basin cocks, that will give smoothness on the inside and permit of easy and free cleaning of cores from the castings. We would like to know the best binder and proportions. Also any other information that will permit us to get this work out in a first class manner. We are starting to use the multiple corebox system, and are having trouble with our castings from rough interiors and metal burned in.

A.—For a good core mixture for brass plumbing supplies, bibbs and basin cocks, use white silica sand 40 parts, Albany sand 2 parts, woodseed liquid core compound 1 part. Use your own judgment about the strength of cores. A basin cock core is more fragile than bibb core. For greater strength of cores add more Albany sand. To have clean castings and permit easy and free cleaning of cores from castings, have the molders blow the cores out when the castings are hot.



BIBB COCK VENTED ALONG DASH LINE.

Use dryers when backing cores, more especially bibbs and basin cocks, so the cores do not warp. The above mixture is used by the Mueller Manufacturing Co., and the Haydenville Co.

As stated, have your molders blow the cores out of the castings at the right temperature and see the results you will get. You should have as smooth a casting inside as outside, and when you machine your castings you will get good results in wear on tools, also production. One of the worst handicaps in machining bibbs and basin cocks is burnt sand in the cap or seat end.

If you are having trouble with your bibbs blowing on seat vent your core at the seat right through the belly of the core by having a 1/16 in. hole in the belly of the core box. (See sketch.) P. W. BLAIR.

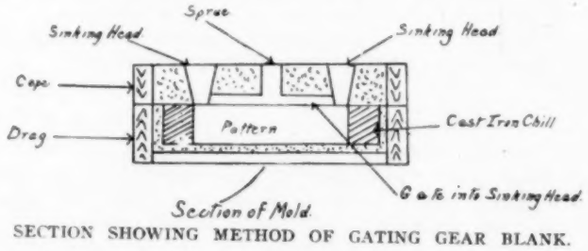
CASTING GEAR BLANK

Q.—We are desirous of obtaining information in regards to the casting of bronze gear blanks, in iron chills.

The blanks we have in mind are 12 in. in diameter open in center and weigh about 30 pounds. We wish to know how these chills are used in the molds and the general shape of them, thickness, etc., also are these chills made of steel or grey iron? At what temperature should the metal be poured to obtained best results?

A.—The process used for casting blank gears consists of casting and finishing a chill to fit the O. D. of your gear pattern. This chill is made of cast iron and should fit snug and be from 1½ to 2 inches thick for a gear blank 12 inches in diameter.

Flasks are made to suit the job and consist of round flasks with no more sand allowed than is necessary. The chill is placed in the flask, then the pattern, and they are rammed up in a core like sketch. The cope can be made in green sand. Note the method gating. The gate is in the cope and runs in the riser. The chill by quickly solidifying the bronze improves the grain structure, thereby insuring a strong metal.



SECTION SHOWING METHOD OF GATING GEAR BLANK.

The mixture of English Gear Bronze consists of 89 copper, 11 tin and should be poured about 1900 Fahr. It is essential that proper melting practice be obtained to get the result desired on this class of work.—W. J. REARDON.

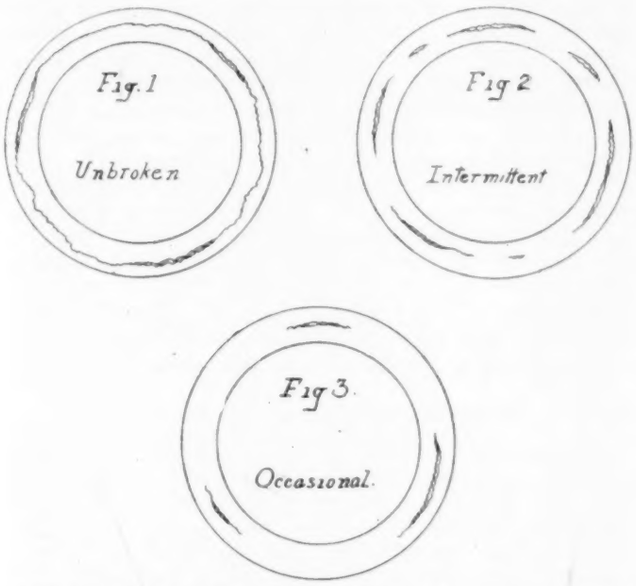
Annular Cracks

A Discussion of the Various Theories Accounting for Their Formation

Written for The Metal Industry by R. R. CLARKE, Foundryman

TYPES OF ANNULAR CRACKS

In its present sense the term "annular crack" indicates a line of cleavage in the wall metal of ring shaped castings, following a circular lead more or less parallel to the bounding circumferences. The definition is fairly general but is meant to apply primarily to bushings. A phenomenon somewhat similar sometimes shows in thin,



END VIEWS OF THIN-WALLED BUSHINGS SHOWING DIFFERENT FORMS OF ANNULAR CRACKS.

flat castings, such as a plate 1½ inches thick by 40 inches in diameter, where a horizontal plane of cleavage occasionally develops. In bushings these cracks have occurred in the writer's experience mostly under the following conditions: First, where the walls have been comparatively thin; second, where the casting, exceeding approximately 3 inches in diameter and 4 inches long, has been molded in upright position; third, where the metal had a relatively high shrinkage; and fourth, where the molding and pouring were not up to standard. In the bushings of heavier wall, and in those cases where the casting has been made in a lying-down position, the tendency has not been so common, though it has not been entirely absent, especially on the cope side of the larger bushings. At this point, however, it may be safe to state that a great many castings have included this disturbance but never shown it because the machining was insufficient to disclose it.

The annular crack is ordinarily invisible in a rough casting because of a surface crust formation of considerable depth. Thus a bushing escaping all suspicion by inside, outside and end finishing might disclose most damaging evidence if cut up into small rings. Similarly the status of a bushing functioning as an ordinary sleeve might radically change if required to pass the hydraulic test.

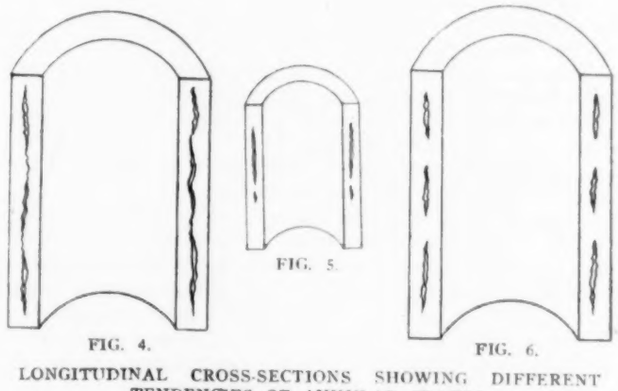
Though fairly inclined to observe regular lines in their circular directions, annular cracks observe but scant uniformity in position, extent or intensity. In the wall metal they may exist unbroken, intermittent or occasional. They sometimes localize in upper or lower vicinities of the casting, sometimes disrupt middle portions and occasionally extend from top to bottom throughout. In one place they may appear as a dim line of fracture, in another they may enlarge to a wide open breach. Though comparatively rare, instances can be recalled where by their completeness the casting practically separated into two parts, an inner and an outer shell.

POSSIBLE CAUSES

The origin of the annular crack seems to be a debatable question. Of the different theories claiming to account for it, none, so far as we are able to judge, can be said to stand alone and completely defy refutation. The inference is that the effect can follow different causes acting more or less in concert and that no single one enjoys full patent rights.

The primary object of this discussion is an examination of these theories and their relative values. Briefly they are: First, the theory of inadequate feeding; second, the theory of agitation; third, the theory of bad melting; fourth, the theory of pouring temperature; fifth, the theory of metal property; and sixth, the theory of unequal congelation.

"Inadequate feeding" concerns end pouring and reasons from the hypothesis that shrinkage exceeds replenishment and localizes to form the rupture. To reason on the hypothesis given is to limit the disturbance exclusively to the upper casting in the form of a breach relatively wide at the top and diminishing downward, much the same as the pouring sprue shows it except for its larger dimensions in the bulky sprue than in the light bushing wall. Now, the condition could scarcely exist without indicating on the cope surface of the rough casting where the annular crack is seldom if ever revealed. Further, it is not the tendency of natural shrinkage to localize visibly in thin uniform metal bounded by expansive mold surfaces. Where bulk varies or surface to volume is



LONGITUDINAL CROSS-SECTIONS SHOWING DIFFERENT TENDENCIES OF ANNULAR CRACKS.

low this tendency naturally prevails, but the thin walls of bushings admit neither of these conditions. Further contradicting testimony is the indication of a diametric movement of separation. Natural and uniform shrinkage commonly heads downward to the center of solidification, yet the surfaces of rupture in the bushing walls contain no evidence of a downward pull. The theory fails utterly to account for the lower casting. By all the principles involved the upper mold metal ought to compress,

feed and solidify the lower metal regardless of the gating, yet the cracks often appear in this lower metal, notwithstanding. More important than all analyses are the findings of experience. Strong, multiple gates attached to the top inside surface have been tried without lending any substantial support to the theory.

FIG. 7. CROSS SECTION SHOWING CRACK IN FLAT CASTING.

The theory of "agitation" relies on wet sand and hard tamping, and connects the rupture with the metal unrest which these errors undoubtedly produce. It emphasizes also the resistance of a hard core to the centerward strain. This, however, may easily be over-rated since, beyond a given resistance, the longitudinal crack becomes the more accommodating medium of release, especially to thin metal. The theory is weakened by the moral certainty that a mold so agitated as to produce internal rupture of metal could never escape serious cutting and scabbing in the absence of which the annular crack freely develops. As involving strong secondary causes, the theory must be respected, but as for explaining basic causes it has practically no standing.

The theory of bad melting might be more directly termed "The theory of oxide film partition." Briefly the contention is that particles of highly oxidized metal are surrounded in cooling by an oxide film, which destroys cohesion and consequently prevents union. Localizing planes of fracture are explained by the well-known law of concretion, to proceed from bounding surfaces toward the center of mass. In the case of the bushing the theory recognizes two primary planes of congelation, one moving from the inside or core surface outward, the other proceeding from the outside surface inward. The oxide film is regarded as concentrating on the surfaces of these planes and interposing union, when the two planes meet; hence the annular crack.

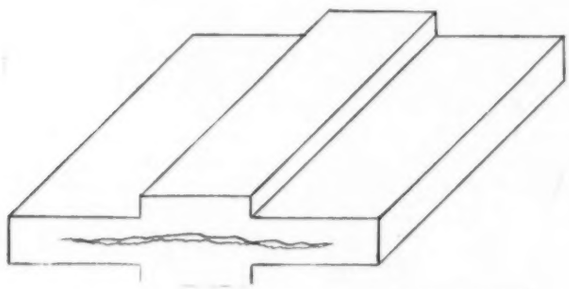


FIG. 8. PLANE OF PARTITION IN FLAT CASTING.

Here we find much sound reason supported by many of the undisputed certainties of experience. No theory for superinduced weakness or rupture in metal as herein considered can ever be established which ignores oxidation. At the same time it can as little disregard all other forces. In the oxide film we recognize strong argument but between it and a complete explanation of the annular crack we think we discern a few missing links. The following brief observations are accordingly submitted:

First. The theory practically disregards physical forces without which several features of the crack are hard to understand. Interposing film will explain a "line" of fracture but never account for the open breach so often in evidence. Its sole function is discharged with mere separation of the metal. Again on the opposite walls of the breach are sometimes fibrous projections indicating a tearing apart rather than mere partition by obstruction. These along with other phenomena intimate more than mere passive forces. They suggest armed intervention.

Second. In many castings showing the annular crack the metal has been otherwise clean and solid in finishing. This could scarcely be looked for in extreme oxidation.

Third. Annular cracks are mose frequent and severe in certain alloys in which oxidation is commonly regarded as easy to control. High zinc mixes are especially troublesome, yet a conceded power of zinc is to reduce oxides.

Fourth. If the theory is absolute, then in their zones of final concretion all castings from a poor melt must be seriously imperfect.

Fifth. The theory admits the possibility of a false premise. Its authors regarded the film as a cause of fracture. They might have as justly considered it a result of fracture, since all the phenomena of oxidation follow hot fracture as for instance, when castings are heated and broken. It is therefore not impossible that they mistook an effect for a cause.

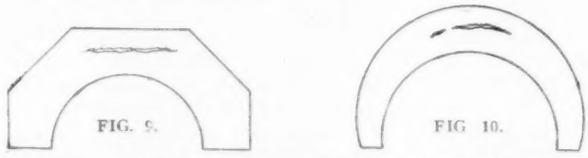


FIG. 9. FIG. 10.

PLANES OF PARTITION AS THEY OCCASIONALLY, THOUGH RARELY, DEVELOP IN CAR BOXES AND CROWN CASTINGS. COLD POURING FAVORS THEIR DEVELOPMENT.

This article will be concluded in a later issue.—Editor.

Tinning Babbitting Car Boxes

Q.—I would like to get full details of how car journal bearings are tinned and babbitted. I believe iron molds are used in holding the car box while the babbitt is poured on the face.

A.—Bronze bearings or car journals which are to have babbitt linings should be first tinned by immersing in a pot of solder molten. Use solder of "half and half" composition and zinc chloride as a flux.

The journal or shell should be babbitted immediately after tinning. Babbitt should not be used for tinning because it has a much higher melting point which makes it difficult to maintain a molten film on the surface to be tinned. To avoid blow-holes and defects in babbitt linings cover the mandrel with a thin coating of clay wash by plunging it while heated into a pail of water containing in solution one or two pounds of Jersey red clay. When the mandrel is dry the clay coating prevents the formation of bubbles and the lining has a smooth surface. Oil causes the babbitt to blister. When babbitting solid bearings it is the practice in some shops to smoke the mandrel or cover it with paper to facilitate its removal from the bearing. For two part bearings this is not necessary. Whenever practicable the bearing should be in a vertical position when pourng. A broad thin stream of metal or one that is intermittent tends to produce porous areas or blow-holes. Putty is preferable to clay for luting or sealing the ends of the bearings as the moisture in the clay tends to cause sputtering.

P. W. BLAIR.

Property owners are urged to improve the appearance of homes and other buildings by demanding the use of from 30 to 50 per cent of zinc oxide in the paint pigment. This material is said to increase the life of both exterior and interior coatings, insure lasting lustre and prevent fading. Paint which includes the proper proportion of zinc in the pigment mixture, it is claimed, better finds its way into the pores of the surface, and thus affords excellent protection against deterioration.

Tumbling Brass Castings

Successfully and Otherwise

Written for the Metal Industry by WILLIAM H. PARRY

By the intelligent use of the various types of tumbling barrels now on the market, brass castings can be thoroughly cleaned without destroying their shape and rounding off all the square corners. The type most used, and abused, are those revolving about an axis, parallel to the floor. They are shaped in various forms, from four to twenty sided, some as plain cylinders and others not infrequently as cone frustrums.

As the name implies, the castings are tumbled in these containers until such time as in the judgment of the operator, if he has any; they are taken out free from sand and fins, and beautiful to look upon, **sometimes.**

The term tumbling as applied to the cleaning of castings is not in general use throughout this country, as the terms rumbling, rattling, and among the Pennsylvania Dutch, churning are also used. In any event, the treatment is very much the same. It consists of filling or partly filling, the receptacles with castings, refuse, and sometimes liquids, rotating the whole mass which, if it has been properly proportioned, will give good results, if not continued for too long a period. The type known as the oblique, which as a matter of fact will rotate in any old plane, is in every day use on medium to light work, and will give splendid results if properly handled.

There is no set rule to lay down which will apply to any and all classes of castings; rather by far the application of a little common sense is the best medicine. For instance, let us suppose you are operating horizontal tumblers, say of a thousand pounds capacity and your castings weigh from 20 to 40 pounds apiece, you would not fill your barrel with such castings only, to batter each other out of all semblance to their original shape in a very short space of time, when by partly filling the barrel with foundry refuse, tumbler weights (or stars) or even broken stone you will prevent the castings from injuring one another by forming cushions, or peacemakers between them at the point of impact.

There is another method of loading tumbling barrels which is very successful, that of wedging the castings so that they are carried around with the barrel, thus preventing nicking and bruising, and permitting the free circulation of the cleansing medium around, through, and over the castings. By this method the Worthington Works at Harrison, N. J., cleaned iron castings weighing a ton and over in tumblers operating in pits below the floor level, and big enough to hold six in each unit.

There is still another method of loading a tumbler, when the castings are such that if placed in the barrel, they will form one mass after a few rotations, or in other words will be jammed into one another as per E Pluribus Unum. The cure for this state of affairs is placing other castings different as possible among those of the clinging type, and the very best results will show by loading the barrel with various kinds of about the same weight.

I personally witnessed a most distressing case of mistumbling some twelve years ago in a brass foundry that used tumblers at that time for the purpose of beating the furnace slag out of the spillings and droppings plus the general foundry refuse, and for that purpose they worked fine. On being asked to tumble some bushing castings the foreman had them placed in these tumblers along with the crushing weights, which averaged about 20 pounds apiece, and while water may form a cushion if properly confined, it failed in this instance, as the bushings were hard to recognize, being neither round, square nor oblong in cross section, due to the terrific battering received from the weights for 20 odd minutes.

Not being a believer in dry tumbling for castings just out of the brass foundry, the reader is asked to allow for the free use of water in all tumbling operations, providing ample ruffles to catch the overflow, however.

While it would be far fetched to advocate that an alarm clock be included as part of every tumbler, yet some means must be provided to remind the operators of the proper unloading time of each charged barrel, instead of leaving it to the usual haphazard tactics in vogue.

My experience with tumbling barrels makes me a believer in the oblique type, as the action on the castings is of a more soothing nature. They are to be likened to a quiet bed fellow, as against the other kind who either from bad dreams or "bootleg" boiling in his innards, is constantly thrashing about and punching everybody within reach. Why oblique barrels are used for small to medium work only is beyond me, as the mechanical principle of this device can be applied to work of any size and kind, with the added advantage of the open end of the barrel giving the operator the opportunity of constantly supervising just what is taking place inside. Again, a constant flow of water is not necessary to maintain in this type of barrel, as once charged at loading time the original water need not be added to. It will be noticed that castings tumbled in oblique barrels are seldom nicked so as to be noticeable, as the castings roll over one another and are not carried over the center and dropped on each other as in the horizontal type.

As these barrels are always made in the shape of truncated cones with the base at the bottom or closed end, it follows that they will hold a lot of water and castings when rotated in a plane approximately parallel with the floor, though in common practice this is seldom done.

Adding a small quantity of either sulphuric or hydrofluoric acid to the water shortens the cleaning period, and also the life of the barrel.

The question of horsepower consumed in operating tumblers is a very serious one, particularly when a battery of them are driven at too high a speed and chock full of castings and water. Tumblers that are driven direct from a line or jack shaft by belt, are not usually long lived, and the power consumed by such an arrangement is enormous. Geared tumblers are the most economical in the long run, and those designed with the pinion as the driver to the big gear, which in turn operates the friction rollers that rotate the barrel, are the very best on the market because, if overloaded will act the part of a sensible horse, and refuse to move until some of the cargo is jettisoned.

The speed at which tumblers are rotated is always too high in my estimation, most people believing that all races are to the swift regardless of consequences, which in tumblers means, high power consumption, frequent replacement of barrels or staves, badly battered castings, big water bills, and frequent breakdowns. On the other hand it will not do to have them rotating so slowly that even the castings will not tumble to the fact that they are expected to be gentlemen, and get a move on themselves once in a while. Some of the sandblasting tumbling barrels revolve as slowly as twice in a minute. This is ample for their purpose, which is the presenting of all surfaces to the action of the blast. Such speed on the other hand would not do for ordinary tumbling.

The best and safest rule to follow on speeds is to cut the catalogued speeds 25 per cent minus for a start, and as your knowledge of the art (?) increases you will be best able to judge the most economical speeds.

Utilization of Scrap and Residues in Metal Foundries

By C. Diegel, from Betrieb, Nov. 10, 1920. P. 62-66—Part 1.

Abstracted for The Metal Industry by R. E. SEARCH, Exchange Editor

The qualification of scarcity arising from the war refers to metal which could not be obtained in Germany in sufficient quantity to cover the necessities of the hour and its use on that account for economical reasons had to be confined to or met by substitutes for the German product. The substitution for copper, bronze and brass castings by iron and steel, or by zinc or aluminum and other metals of German origin was possible, however, only within certain limits because the substituted material lacks various important properties that are peculiar to the copper alloys and cannot be done without for important constructive work.

Also it is shown that in the use of copper alloys it was necessary to exercise the precaution never to exceed the necessary weight, because of their scarcity, and to obtain no more raw material from foreign sources than was absolutely necessary.

In this respect the question was entirely one of carrying on of an economical management in foundries and machine shops connected with it, especially in the systematic collection of the scrap and residues of all kinds of metals and foundry materials.

Good raw material was at a premium, so the problem was to dispense with as much of it as was possible and to diminish the wastefulness that is so prevalent in large works.

In setting about this task, three important things had to be borne in mind: 1st. The metal (copper alloys) needed or metal residues must in no way get lost. 2nd. The metal scrap, turnings, chips, sweepings, refuse, of all kinds must be carefully sorted and separated. 3rd. The use of the amount obtained must be supervised and directed, that is the separate alloys must be classified according to their composition, and their use intelligently specified or personally directed. The prevailing thought everywhere was to use no better grade of metal than the order absolutely required, filling the specifications literally but never exceeding them as was the custom before the war. The work must begin with the collection and sorting of the scrap or of the old metal, in order that the valuable metals may be saved from contamination with such metals as aluminum or antimonial scrap. The following scheme was recommended:

THE COLLECTION AND SORTING OF THE WORKSHOP SCRAP

In any shop care must be taken that the metal chips and turnings do not become widely distributed as this can easily be prevented with the harder alloys. Chips should be led to a collection receiver so as not to be trod under foot. Where this cannot be avoided the flooring must have a smooth continuous surface. So far as possible the cutting or turning machines are to be set up in such a way that different sorts of metal will be separately worked, and the turnings, chips or dust of the same composition may be kept by themselves. This arrangement is of special importance for particles of aluminum or of aluminum alloys, for their presence in other alloys will frequently cause porosity, especially in castings that must be submitted to a hydraulic test.

Likewise white metal chips should be kept out of the way, as their antimony content would make other compositions brittle. In the same way bronze and gun-metal chips should be kept separate, because the addition of brass chips to them is detrimental; if a small amount of their chips be added to brass, their low tin content makes the working of brass very difficult, especially where the latter is to be rolled or drawn into tubing or wire. (This difficulty is noticeable at as low an amount as 0.2%.) Furthermore bronze chips have so much higher value that they must be carefully separated because any mixture either way alters the original composition.

In any workshop, its efficiency is more than doubled if the various metals, as they come from their own source of production, or from the seller are kept in iron boxes for each sort of chips and scrap. The contents can be indicated in large letters on the box covers. The daily collection of chips and scrap from the various turning or finishing machines are sent to the correct sorting boxes and their separation entrusted to careful intelligence in order that the usual miscellaneous mixing be avoided. This collection is assisted by each machinist at work on any metal or alloy, by his knowledge of what the composition is of the metal he is working on. He is given this information before he cuts his first shaving. Every worker entrusted with the work of dressing or finishing a piece should receive instructions and supervision to this end.

Oil smeared chips are sent to the centrifuge machine for the removal of the oil before going into the storage boxes. The collection boxes are kept carefully closed in order that their contents shall not be pilfered. So far as the shop sweepings contain metal they are collected in barrels every evening and sent to their special collection box. The collection boxes are provided with two handles, their contents are taken at least once every week and emptied into the proper stock bins close to the foundry. Every separate kind of chip and scrap has its own bin, each bin is properly labelled and the composition of the metal it contains is registered on a suitable stock card kept in plain sight.

MELTING OF THE SCRAP AND CHIPS

Scrap consisting of uniformly solid pieces and their composition known can be used advantageously for castings without a remelt, thus saving costs of various kinds. On the other hand where there is a mixture of scrap of various kinds whose sorting has not been carried out with intelligent and scrupulous care, or where some of the scrap has adhering particles of soft solder adhering to it, or where one kind of metal has been brazed to another kind of metal and the two parts have come to the scrap pile inseparable yet of different quality, the lot is re-sorted as far as possible by a color separation, or by their hardness and marked by an instructed overseer, in order that bronze, gun-metal, brass, aluminum bronze, light aluminum alloys, and other alloys be separated before remelting. In doubtful cases expert foundry employees could recognize the character of the alloy by its fracture, and sometimes by a simple file test. From brass the parts will be kept separate to which soft or hard solder adheres; the rest of the brass is hot—pressed into shaped masses. Scrap from rolled bars, from new and old sheets are kept separate. Every sort of metal that is finally to be mixed together is melted separately in crucibles and finally brought together in a large pouring ladle, well stirred and cast into small ingots. These are properly marked when in ingot form, with the number of the melt, because a list of the metals assembled previous to the final melting has been kept for future reference.

In bearing metals every sort of ingot is kept to its own classification by composition, in separate bins. A registred sheet is kept with the number of the melt and the composition of the fusion recorded for reference. By thus having a complete record of every sort of stock on hand, selection can often be made to form a desired composition without the necessity of resorting to wholly virgin stock. If the test heat proves unsatisfactory, and the melter is a trained metallurgist he will know at once just what to do to add to his selected scrap to make the alloy up to the ordered requirements. If the ordered alloy is a brass all he has to do is to select his metal from the hoarded brass scrap and if the test heat proves unsatisfactory all he has to do is to add either copper or zinc to bring his metal up to the standard of his requirement. A further advantage of such careful classification is the fact that by intelligent selection from such a stock of scrap much more homogeneous castings can be produced than where the melt has to be made wholly from virgin stock of the original metals.

The chips or turnings must go to the magnetic separator several times before the remelt in order to remove the particles of iron that are mixed with them. (It has been the experience of the abstractor that one pass over the magnetic separator is not sufficient for even a passable separation; the chips or finely curled turnings become tangled up with some of the finely curled steel chips or turnings and the magnet has not the power to pull them apart. This difficulty may be remedied to a large extent by having the pile of twisted turnings shaken up by a pitchfork or placed in a revolving sieve where the smaller particles of iron or steel will be separated from the brass by the friction to which the particles will be submitted in such a treatment.) Wet or moist chips are previously dried before reducing them to small pieces in the disintegrator to assist the magnetic sorting. As to the remainder the value is increased by melting the same kinds of chips together as far as possible, pouring the melts into small ingots and reserved for further treatment in the same way as the scrap.

The German practice of melting scrap and chips is to use the tilting crucible furnaces, with which every brass founder is familiar. On the other hand the original melting furnace (crucible stack furnace) with natural draft, with portable crucible to be lifted out for the pouring operation, using coke as a fuel, reduces the consumption of fuel one third, but with the crucible enclosed, the consumption reduction comes down to one half, whilst the efficiency in consequence of the quickness of the melting operation is increased to double the amount.

TREATMENT OF PURCHASABLE OLD METAL, GATE HEADS, OR RUNNERS KNOCKED OFF IN FOUNDRIES FROM THEIR OWN STOCK

So far as the purchase of old metal is necessary or offers an advantage, one chooses the metal in the best way possible. The molten shot or spillings are carefully sorted out as described in Table 2 for scrap. Larger pieces could be analyzed and used immediately; for example, they could be used for cylinders, hydraulic pressure metal, gun-metal tubing, etc. It is also valuable for smaller, similar parts like spindle bearings, cartridge bands and cases, etc., for which the analysis of a number of tapped samples would be sufficient. (Cartridge cases consist of a very pure brass which contains exactly 72% copper and 28% zinc. Gun cases from 67% copper and 23% zinc). As to the rest, the separate sorts obtained by selection for the melting are cast into small ingots and analyzed.

The gate ends dropped off and the burrs of castings are alike sorted separately according to their composition and are to be added to the meltings for the same castings with gate heads and crucible residues from brass which are carried from the first meltings with a calculation of the reduced zinc content. Waste castings are treated like gate heads, so long as the reason of the waste has nothing to do with the kind or the purity of the metal involved.

RECOVERY OF THE SPILLINGS

With the pouring of many small patterns or many flasks at a time, some of the metal overflows the flasks and spills on the floor. This metal cannot be collected with the good castings, the spills lie about the floor in small shot of all shapes and sizes, and is redeemed by sieving out from the sand on the floor or in the spilling troughs. In large foundries the sand for this purpose is reduced to small particles in a mill and then sieved into a trommel or tumbling barrel or for both purposes is used combined with a trommel sieve and a ball mill. All the metal particles thus obtained are separated, melted, poured into small ingots and analyzed. This remelting, however, is superfluous, if the collected portions of an alloy agree and mixtures are excluded. In order to avoid these mixtures it is advantageous to keep the casting places separate for gun-metal, brass and other alloys or metals.

THE USE OF SWEEPINGS

The sweepings are taken away with the burnt out crucibles, accompanied by the cleaning of the furnaces, and by the slag to which metal particles adhere. The sweepings are sold to the junk dealer without guarantee or recourse or are sold to the smelting works for the recovery of the copper they contain, because the recovery in small works is not a profitable operation. Such sweepings sometimes contain as high as 16% copper and on that account are valuable. The coke that is sorted out and separated is used to heat the drying ovens.

Large foundries with suitable apparatus show considerable savings in reclaiming the metal from sweepings. Sweepings and charges are kept separate in order to obtain the metal from separate alloys and not to contain valuable metals in small quantities. For working the sweepings the useful coke is sorted out by sieving and the finer particles are discarded. The sweepings remaining on the sieve consist of slag coated particles which are sent to the ball mill and are kept there until all non-metallic particles in the shape of dust or ashes have fallen through the sieves to which they are sent and pass through a 3 mm. mesh. The granular metal goes to the jigging machines, in which particles of ashes are still present; these are washed out by the upward flow of water and the metals rising with the flood are washed away laterally. The metal grains so purified from ash and slag, in a dried state, are taken to the magnetic separator to remove the iron particles that have been carried along with them. By this time the metals thus saved could be used immediately if the alloy from which they came were known, or if lacking this information, could after running down into small ingots be analyzed. All the fine stuff from the sweepings, dust and slag particles containing metal is mixed with water in a trommel, and converted into a slimy pulp, and placed upon a shaking grate. The lighter, non-metallic particles are washed away, whilst the heavy metallic particles are sent to the sump beside the grate. The contents of the sump are dried, sent again to the magnetic separator to rid them of possible iron particles, and in the smelting of them about 40% of the copper it contains can be recovered.

This article will be concluded in a later issue.—Editor.

American Electrochemical Society

Abstracts of Papers Delivered at the Annual Spring Meeting in Atlantic City, N. J., April 21-23, 1921

The feature of the meeting was the symposium on corrosion, which disclosed differences of opinion between those who advocated pure iron or steel and those who believed in copper-bearing iron or steel. Among the papers given were the following:

THE USE OF FLUORIDES IN SOLUTIONS FOR NICKEL DEPOSITION

By William Blum

The author discusses the factors governing the deposition of hard deposits of nickel from solutions containing fluorides with and without boric acid and other salts. The general principles of getting good deposits are discussed, showing that low acidity favors good nickel deposition, but high acidity good anode corrosion. The bearng of hydrogen ion concentration on the matter is explained. The effect of additions, such as boric acid, is probably through their effect on hydrogen ion concentration. Deposits of finer structure and higher tensile strength are obtained from fluoride solutions than from the corresponding chloride solutions.

DUCTILE ELECTROLYTIC NICKEL

By Chas. P. Madsen

This paper records the discovery that if cathodes in a nickel bath are periodically lifted out of the bath, exposed to the air, and re-immersed within a certain limiting time, the nickel deposit is not laminated, but is greatly improved as regards freedom from pitting and mechanical properties. Automatic apparatus for lifting out the cathodes at proper intervals and keeping them out the proper time, was devised, resulting in nickel of greater ductility and tensile strength than heretofore obtained. The deposit has great malleability and surprising hardiness, by Brinell test, considering its high ductility.

THE GAP BETWEEN THEORY AND PRACTICE IN THE PRODUCTION OF CORROSION-RESISTING IRON AND STEEL

By William D. Richardson

A general discussion of the explanation or theory of corrosion-resisting iron and steel and their alloys. Practical results have been empirically attained, and at present theory is very much lacking. Lack of fundamental data of the primary action of oxygen on metals and alloys is also hindering progress. The electrolytic theory of corrosion is discussed at length; also the influence of oxygen, in detail, and the role of adhering rust. Accelerated corrosion tests are studied, and their defects pointed out. The behavior of copper-bearing iron, silicon-containing cast-iron, nickel and nickel-chromium steels, nickel-copper steels, chromium steels, and nickel-cobalt-chromium alloys is discussed.

ANOMALIES ENCOUNTERED IN A STUDY OF IMMERSION TESTS OF IRON AND STEEL

By Allerton S. Cushman and George W. Coggeshall

A plea for considering all possible factors when comparing corrosion tests of iron and steel, on the ground that there are in reality so many and so obscure variables that it is very easy to draw wrong conclusions. Change of rate of corrosion is also frequently met with, so that extrapolations of short-time results are often in error. One anomaly is due to very local corrosion, where the loss in weight over the large surface may be quite small, and yet failure occurs due to highly localized pitting; on the other hand, weight loss may be higher and yet so uniformly distributed that it counts as relatively unimportant. Tests in aluminum sulphate solutions, giving curious colloidal gels, are described. The author denies the protective action of copper in steel.

OBSERVATIONS ON THE CORROSION OF IRON AND STEEL

By J. A. Aupperle and D. M. Strickland

A record of tests on pure iron made in open-hearth furnaces, copper iron, plain steel and copper steel, to determine their resistance to sulphuric acid corrosion. The specimen sheets were tested 60 days in each case, either alone or fastened to sheets of pure iron by copper rivets or iron rivets, forming galvanic couples. In all the cases cited pure iron made in open-hearth furnaces had the smallest corrosion losses.

THE EFFECT OF COPPER AND SILVER SALTS ON THE CORROSION OF IRON BY ACIDS

By Oliver P. Watts and Harold C. Knapp

A record of tests on the corrosion of iron by sulphuric acid in the absence or presence of various salts of copper and silver. The conclusion drawn is that in general corrosion is stimulated by the presence of these salts. The theory of this action is discussed. A remarkable example of electrochemical corrosion in sea-water is given.

EXPERIMENTS ON THE CORROSION OF IRON AND STEEL

By T. S. Fuller

Records observations on the behavior of drops of water standing on pure iron and other metals; also standing partly on iron and partly on zinc or brass. Results of oxidation are usually perceptible in one minute and quite marked in 15 minutes. If the drop evaporates completely, well-marked zones remain on the metal. Progressive placing of fresh drops on the same spot, and allowing them to evaporate, showed that the first drop was much more active than subsequent drops, indicating that a partial immunity is progressively built up. Copper-steels were compared with cold-rolled wrought iron, showing copper to slow up the rate of rusting.

RECENT PROGRESS IN HIGH FREQUENCY INDUCTIVE HEATING

By E. F. Northrup

A description of the present status of high-frequency oscillating current furnaces for experimental, laboratory and commercial work. Also of the high-frequency converter sets made for use with them. Furnaces of seven types are described in detail and the actual performances given, showing them to run at 30 to 40 per cent electrothermal efficiency.

ELECTRODYNAMIC FORCES IN ELECTRIC FURNACES

By Carl Hering

A number of recently discovered mechanical forces are described which are of electric origin and which may be made use of, or may be detrimental, in some types of electric furnaces, chiefly those in which the heat-developing resistor is a liquid, which responds to these forces more readily than a solid. Such forces may be usefully applied to cause the liquid metal to flow very rapidly through the heat-developing resistor, thereby enabling the furnace to be forced, and to cause a strong upward circulation in an adjoining bath, by which the metal is refined of suspended impurities and made homogeneous. After referring briefly to the formerly-described "pinch effect," a description is given of the "stretch effect" and of the "corner effect," known also as the "motor effect."

Platers' Wrinkles

A Revision of the Old Edition of the Booklet with Many Additions—Conclusion

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

The following comparative figures show the economy of copper cyanide over the copper carbonate. Copper carbonate contains 50 per cent metal and 50 per cent carbonate and requires 1¾ pounds of sodium cyanide to convert to the double cyanide and give a small excess of free cyanide. Copper cyanide contains 70 per cent metal and 30 per cent cyanogen and requires 11⅓ ounces to equal one pound of carbonate of copper. The copper cyanide only requires 12 ounces of sodium cyanide to put it in solution. When a carbonate is required 4 ounces of soda ash (58 per cent) added will be ample. Both combinations give identically the same results as a replenishing medium. The saving is apparent in that 1 pound of sodium cyanide may be eliminated on each 8 ounces of copper put in solution, which equals 40 per cent metal.

When your acid copper baths commence to give trouble, add common alum to them in the proportion of 1 or 2 ounces to the gallon, before making any further additions. If this does not overcome the trouble your bath needs metal, it is then advisable to reduce the bath somewhat with water. Then add as much sulphate of copper as your bath will absorb over night. This can be readily accomplished by suspending the copper salt in the usual acid dipping baskets made from earthen ware or aluminum upon your negative or work poles, or common burlap bags can be used for the purpose. Free sulphuric acid is required for anode reduction as well as conduction, just as free cyanide is used in cyanide solutions.

When a brass solution produces a bronze or low brass tone, it does not need zinc or ammonia, but copper. If the brass foundry alloys are studied it will be found that two or even three parts of copper to one of zinc give yellow tones; also equal parts of these metals produce bronze or reddish yellow colors. If this is borne in mind, considerable trouble from white or grayish brass colors will be avoided. Add only copper after a bath is once prepared, when metal is necessary. If the deposit should then show a reddish or bronze tone, a little zinc cyanide mixed with water of ammonia and stirred in the bath will produce a good brass color.

Conducting salts for copper and bronze solutions consist of sodium bisulphite, sodium sulphite, caustic soda, soda ash and hyposulphite of soda and for brass solutions, soda ash, caustic soda, aqua ammonia, carbonate and chloride of ammonia. The metal cyanides consist of the following proportions of metal and cyanogen:

Silver Cyanide—80 per cent. metal—20 per cent. cyanogen
Copper Cyanide—70 per cent. metal—30 per cent. cyanogen
Zinc Cyanide —55 per cent. metal—45 per cent. cyanogen

Voltages necessary are as follows: still solutions, copper, brass and bronze—3 to 4; mechanical solutions—7 to 10; acid copper (still)—1; agitated—2 to 3.

ZINC, TIN AND LEAD SOLUTIONS

Alkaline Zinc Solution

Water	1 gallon
Sodium Cyanide	7 ozs.
Zinc Cyanide 55%	8 "
Sodium Sulphate	4 "
Sodium Fluoride	1 "
Caustic Soda 76%	½ "
Corn Syrup	½ "

Temperature of solution 120 to 140 degrees Fahr. at 4 volts. Alkaline zinc solutions are best adapted for steel and wrought iron. They do not give satisfactory results upon cast iron. Fifty per cent of the chemicals given may be used and still give good results.

Acid Zinc Solutions

Water	1 gallon
Zinc Sulphate	1½ lbs.
Sodium Fluoride	2 ozs.
Magnesium Sulphate	2 "
Corn Syrup	4 "

Temperature of solution 100 degrees Fahr. at 4 volts. Use anodes of cast zinc containing 1 per cent aluminum. The proportions given for acid solution may be increased 50 per cent for barrel plating with an increase in voltage of 100 per cent.

Alkaline Tin Solutions

Water	1 gallon
Caustic Soda, 76%	4 to 8 ozs.
Tin Chloride, crystallized	2¾ to 8 ozs.
Powdered Rosin, yellow	10 grs. to ⅛ oz.

Temperature 180 to 200 degrees Fahr. at 1 to 1½ volts.

Acid Tin Solution

Water	1 gallon
Phosphate of Soda	3 ozs.
Tin Chloride	1 "
Common Salt	1 "
Tartaric Acid	¼ "

Temperature of solution normal to 100 degrees Fahr. at 1 to 2 volts. Anodes of pure tin should be used.

Alkaline Lead Solution

Water	1 gallon
Caustic Soda, 76%	24 ozs.
Lead Acetate, Crystallized	8 "
Powdered Yellow Rosin	¼ "

Temperature 180 to 200 degrees Fahr. Voltage 1½ to 2½.

Acid Lead Solutions

Water	1 gallon
Lead Fluosilicate	10 to 14 ozs.
Hydrofluoric Acid	8 to 12 "
Boracic Acid	2 ozs.
Gum Arabic	⅛ to ¼ oz.
Water	1 gallon
Hydrofluoric Acid, 40%	2 lbs.
Boracic Acid	12 ozs.
Dry Lead Carbonate	16 "
Gum Arabic	⅛ to ¼ oz.

Temperature 80 to 100 degrees Fahr. at 2 volts. Use anodes of pure sheet or cast lead.

GOLD, SILVER AND PLATINUM PLATING BATHS

Gold solutions may be prepared from the chloride or fulminate, but as they must eventually be converted to the cyanides of the metal, it is always advisable to use the cyanides. Likewise silver solutions are sometimes converted direct from the nitrates to the cyanides, which is bad practice. Silver chloride is still used extensively but silver cyanides are more efficient. Solutions prepared from silver cyanide can be more readily controlled, because they contain very little inert salt (except what is added as a conducting salt) and require much less sodium cyanide in their preparation.

Gold Solutions

Water	1 gallon
Gold Trisalyt, 40% Fine Gold	½ oz.
Sodium Cyanide	¼ "
Sodium Phosphate	¼ "
Sodium Bisulphite	⅛ "

Water	1 gallon
Gold Chloride	⅓ oz.
Sodium Cyanide	1 "
Sodium Phosphate	¼ "
Sodium Bisulphite	⅛ "

Temperature 140 to 160 degrees Fahr. Voltage 2 to 2½. The proportions given may be decreased for flash deposits, or increased for cold solutions or heavy deposits.

Silver Solution

Water	1 gallon
Sodium Cyanide	3½ ozs.
Silver Cyanide, 80% Fine Silver	3 "
Ammonium Chloride	½ "
Water	1 gallon
Sodium Cyanide	7 ozs.
Silver Chloride	4 "
Ammonium Chloride	½ oz.

Temperature 80 degrees Fahr. Voltage ¾ to 1.

Potassium carbonate may be used as a conducting agent, but as the material is less active than ammonium chloride, 1 ounce should be used. The proportions given in formula for silver plating may be decreased or increased according to requirements.

Equal parts of nitric acid and water will dissolve silver much faster than when the acid is used alone, especially when the mixture is slightly heated upon a water bath.

Cyanide of nickel can be used in gold or silver baths to a certain extent. In silver baths one-quarter the amount of silver used per gallon can safely be added. In gold baths one-eighth the amount can be used. Cadmium is also used in silver baths to harden the deposit and reduce cost. Cadmium can also be used in green gold solutions to replace silver. However, equal parts of cadmium and silver give the best results.

It is difficult to prepare a cadmium cyanide. Cadmium chloride dissolved in sodium cyanide should be used or cadmium trisalyt.

Muriatic acid gives better results than salt when precipitating chloride of silver from the nitrate solution. The reason is that nitric acid is formed by the reaction, and this is more readily washed out than nitrate of soda that is produced when salt is used.

In plating soft metal goods with silver, especially for cheap finishes, or where oxidized or gray effects are necessary, a ten-minute deposit in the nickel bath helps to save silver. If the silver deposit cuts through, whitish background due to the nickel deposit still results, where a copper or brass deposit would have to be "doctored up."

For bright silver baths, benzole will be found a good substitute for bisulphide of carbon; it stays up in the solution better. Dissolve in strong cyanide solution in the regular manner, and add about a teaspoonful to every ten gallons of solution. Do not confound benzole with benzine, as this is a different product, resembling bisulphide of carbon, but not so dense.

French grays can be produced directly from a specially prepared silver bath; the bath usually consists of the regular bath, to which is added arsenic dissolved in caustic soda. The articles after plating in the regular bath are immersed in the bath for a minute or two; a dark gray silver is produced which, when relieved or burnished in the regular manner, produces an excellent French gray.

In silver plating, when desirable to produce a hard silver deposit, considerable cyanide of nickel can be added to the silver bath. In a like manner the cyanide of nickel can be added to the gold bath. It produces a harder and clearer deposit that does not tarnish as readily as baths made up with gold alone. The method is much used in gilding low karat watch cases and also upon gold-filled cases.

When preparing a new silver bath be careful not to add too much free cyanide to the bath. It is better to have a little of the silver salt undissolved in the bottom of the tank than an excess of cyanide. New baths are sometimes very erratic. A little water of ammonia added to a new bath helps to age the solution, and a little ammonia added when the anodes have a tendency to turn dark or black will be found of value. If too much cyanide has been added to the bath at any time, add a little nitrate of silver, one-quarter ounce to a gallon. This will be found better practice than trying to take up the free cyanide with chloride or cyanide of silver. Potassium or sodium nitrate is formed, but this does not harm the bath unless an excess is added.

Silver solutions when freshly prepared often act erratically. The silver deposits dark, and granular, and due to the low voltage the anodes do not readily yield up their metal. If small amounts of ammonium chloride, or potassium carbonate, does not correct the trouble then it is advisable to increase the internal resistance by adding very small portions of a brightening colloid. The brightening agent is best prepared by using

Ether ..... 1 part
Bisulphide of Carbon—just so much as the ether will absorb by constant agitation at intervals of about an hour.
Aqua Ammonia, 26%—very small amount, but as much as the mixture of ether and bisulphide of carbon will take up.

Usually from ½ gram to 1 gram of bisulphide of carbon per gallon of new solution is ample combined with the ammonia and other, so one ounce 437½ grams would be ample for an equal number of gallons.

Add sparingly as it is much easier to add to a solution than take away again.

Trouble frequently occurs in flashing the nickel deposit in the silver striking bath, the result being a violet coating which readily peels. The following method to overcome the necessity of a silver strike for this class of work will be found excellent. After cleansing, flash in the warm cyanide of copper bath for three or four seconds, then the usual washing. A five or ten minute deposit in the nickel bath, the usual wash again and place in the cyanide of copper bath for a few minutes or until the nickel deposit is coated with copper, rewash and immerse in a dilute cyanide of mercury bath. A solution containing four ounces of cyanide and one-quarter to one-half ounce of yellow oxide of mercury will be satisfactory. Then wash and place in the regular silver bath. This appears to be a good many operations, but they are quickly accomplished when performed continuously and the results are sure and imperfect deposits are thus avoided.

Silver cyanide should always be used in preparing silver solutions. It should be understood, however, that when silver nitrate or silver chloride is dissolved in sodium cyanide silver cyanide is automatically formed. When the nitrates or chlorides are used the solutions build up in density at least 50 per cent more rapidly, but the constant use of silver cyanide for replenishing purposes avoids this increase in inert materials.

Platinum Solution

Water	1 gallon
Platinum Chloride	½ oz.
Caustic Potash	¼ "
Phosphate of Soda	6 ozs.

Bicarbonate of Soda	1 oz.
Potassium Nitrate	1 "
Boracic Acid	1 to 2 ozs.

Temperature 160 degrees to 180 degrees Fahr. Voltage 5 to 6.

All the salts except the boracic acid may be added to one-quarter of the water, at a temperature of 160 degrees Fahr. Boil for half an hour, then add the boracic acid. Replace the water lost by evaporation. This solution plates very bright.

ELECTRO-COLORING AND OXIDIZED FINISHES

Light Green Gold Solutions

Water	1 gallon
Gold Trisalyt, 40% Fine Gold	⅓ oz.
Silver Trisalyt, 30% Fine Silver	1/10 "
Cream of Tartar	¼ "
Sodium Cyanide	2 to 3 ozs.
Water	1 gallon
Gold Chloride	¼ oz.
Silver Chloride	1/20 "
Cream of Tartar	¼ "
Sodium Cyanide	3 to 4 ozs.

Temperature 80 to 100 degrees. At 3 to 4 volts. Anodes 14 karat green gold or platinum.

Dark Green Gold (Smut)

Water	1 gallon
Gold Trisalyt, 40% Fine Gold	½ oz.
Silver Trisalyt, 30% Fine Silver	1/6 "
Cyanide of Lead	1/18 "
Sodium Cyanide	4 ozs.
Water	1 gallon
Gold Chloride	⅓ oz.
Silver Chloride	1/12 "
Cyanide of Lead	1/13 "
Sodium Cyanide	⅚ ozs.

Temperature 80 to 100 degrees Fahr., at 3 to 4 volts. Anodes 14 karat green gold or platinum.

The chlorides of gold and silver may be used, if so desired, for light and dark green gold solutions. The metal content of solutions prepared from these materials should always equal amounts given in formulæ.

In preparing dark green golds with antique effects the solution should be made up of fine gold and silver, and when the light green gold is produced arsenic dissolved in pure caustic soda should be used; one part of the soda dissolved in a little hot water will dissolve 2 parts of arsenic; also lead cyanide can be used. By careful additions very beautiful antique effects can be produced, especially if the articles are lacquered. Afterwards the aniline colors soluble in denatured alcohol can be applied with camels' hair brushes, producing very fine effects upon the surface of the metal. This must be very dilute; the colors readily penetrate into the lacquer, producing a transparent effect.

In addition to the above some platers prefer the use of lead in producing green golds. When using lead as an addition procure dry carbonate of lead and dissolve in caustic soda, producing a concentrated solution. Add sufficient to give the desired results.

Immersion or Dip Gilding Solutions

Water	1 gallon
Gold Trisalyt 40% fine gold	½ oz.
Sodium Cyanide	3 ozs.
Soda Ash 58%	6 "
Sulphite of Soda	1 oz.
Water	1 gallon
Gold Chloride	1/3 oz.
Sodium Cyanide	4 to 5 ozs.
Soda Ash 58%	6 ozs.
Sulphite of Soda	1 oz.

Use a cast iron kettle heated with iron steam coils for best results.

Salt Water Gilding Solutions

Water	1 gallon
Gold Trisalyt, 40% Fine Gold	2 pennyweights
Phosphate of Soda	2½ ozs.
Soda Ash 58%	6 "
Sulphite of Soda	¾ "
Yellow Prussiate of Potash or Soda	2 ozs.
Sodium Cyanide	1/16 to ⅛ oz.
Water	1 gallon
Gold Chloride	1½ ozs.
Phosphate of Soda	2½ "
Soda Ash, 58%	½ oz.
Sulphite of Soda	¾ "
Yellow Prussiate of Potash or Soda	4 ozs.
Sodium Cyanide	1/16 to ⅛ oz.

Temperature 160 degrees Fahr.

The salt water unit consists of a porous clay jar to hold the solution; a coil of heavy sheet or cast zinc to entirely surround the porous jar; copper rod one-quarter inch in diameter securely fastened and raised above the zinc coil to be used as cathode or work rod. The outer receptacle should be of heavy copper sheet, dimensions ample to hold the porous cell and zinc coil and leave sufficient space not less than four inches between the inside of the copper receptacle and the zinc cylinder.

Small steam coils of copper pipe should be used in the copper receptacle for heating purposes. An iron receptacle can be used in the place of the copper one, but the steam coils must be copper. The receptacle, zinc cylinder and porous jar must all be the same height to keep the solution at a uniform level.

The salt solution, which acts as the electrolyte, consists of granular rock salt 1½ pounds, sal ammoniac 2 ounces, water 1 gallon. Temperature of salt solution 180 degrees Fahr. Of gold solution 160 degrees Fahr.

Rose Gold Solutions

Water	1 gallon
Gold Trisalyt, 40% Fine Gold	1½ ozs.
Soda Ash, 58%	¾ oz.
Yellow Prussiate of Potash or Soda	2 ozs.
Sodium Cyanide	1/16 to ⅛ oz.
Water	1 gallon
Gold Chloride	1 oz.
Soda Ash, 58%	¾ "
Yellow Prussiate of Potash or Soda	3 ozs.
Sodium Cyanide	1/16 to ⅛ oz.

Temperature 180 degrees Fahr. Voltage 5 to 6.

Many platers in the coloring of jewelry claim that for rose gold only pure gold should be used in the form of cyanide of gold. A nearly boiling solution and a high voltage should be used for good results.

In producing rose gold tones either upon brass articles or upon solid gold, what is known as a smut is required for good results. The smut is a darkened surface which when relieved upon the high lights in the usual manner before gilding gives the ground for the rose. The smut can be prepared by using:

Hot Water	1 pint
Muriatic Acid	1 pint
Sulphate of Copper	4 ozs.

This is always used warm; if the surface is too dark, it is run through the cyanide dip to lighten the color.

SILVER FINISHES

French gray finishes are still in vogue. For a good imitation without using any silver in the solution proceed as follows: Take some of the regular nickel solution and add all the common salt it will take up. Dead dip the brass articles and copper plate them in the acid cop-

per bath for a few minutes; then polish or burnish the high lights; place in the salt nickel bath for three to five minutes. Wash and dry out in the usual manner. A finish equal to many regular silver grays will result.

In producing what used to be termed the Butler or Etruscan silver finish, with a dead black background, the same methods can be pursued as in producing Colonial or brush brass finish. Deaden the surface with the aid of a soft brass wire scratch-brush, pumice stone and water. Dry out and lacquer. Then paint in dead black (Japalac), which should dry for five or ten minutes; then the high lights should be relieved in the usual manner, using a mixture of equal parts of boiled linseed oil and turpentine and finish with clean rags.

In the same manner the old English antique brass can be produced upon brass or brass plated goods, or rich effects upon copper or copper plated goods.

In producing oxidized silver effects when a good dark color is desirable. After silver plating, copper for a few seconds in a regular cyanide of copper bath, then wash and immerse in a cold sulphuret solution, made up as follows: Two ounces sulphuret of potassium and one-half ounce of water of ammonia to each gallon of water. Scratch-brush wet, adding a little sal soda to the brush water and then scour in any of the usual methods. This leaves the silver with a good white color beneath, instead of a grayish tone. For a French gray, scratch-brush the oxidized surface by applying a little pumice stone, moistened with water, to the brush. In this manner a gray tone is produced. Go over the high lights with a plater's hand brush and pumice stone to get contrast.

Green Upon Any Metal

Water	1 gallon
Bichromate of Potash	12 ozs.
Copper Sulphate	4 "

Anodes of carbon. Temperature normal at 2 to 4 volts.

Soft Black for Antique Finishes

Water	1 gallon
Double Nickel Salts	5 ozs.
Sulphate of Copper	2 "
Common Salt	2 lbs.
Aqua Ammonia, 26%	6 ozs.

Temperature normal at 2 to 3 volts. Nickel anodes. Dissolve salts in hot water and cool to normal.

Arsenic Black

Water	1 gallon
Caustic Soda, 76%	5 ozs.
White Powdered Arsenic	10 ozs.
Sodium Cyanide 98%	½ "

Use anodes of iron, carbon or nickel. Dissolve the caustic soda and arsenic in part hot water. Add balance cold. Use at normal temperature. Two to three volts.

Antimony for Gray Tones

Water	1 gallon
Carbonate of Soda, Crystallized	16 ozs.
Sulphide of Antimony (Red or Yellow)	8 "

Temperature 180 degrees Fahr. Anodes of carbon. Voltage 1 to 2.

Arsenic Solution, Acid

Muriatic Acid	1 gallon
White Powdered Arsenic	12 ozs
Carbonate of Iron	12 "
Water	2 qts.

Dissolve the arsenic in half the acid by heat. Temperature normal. Use anodes of carbon or nickel.

Arsenic Black for Die Castings. Immersion Solution

Water	1 gallon
Caustic Soda 76%	5 ozs.
Powdered White Arsenic	2½ "
Sodium Cyanide	2 "

Temperature of solution 180 degrees Fahr. Agitate the solution.

Black Nickel Solution (Haas*)

Water	1 gallon
Double Nickel Salts	12 ozs.
Sulphate of Sodium	2 "
Zinc Sulphate	½ oz.
Rochelle Salts	½ "

Use anodes of nickel at normal temperature. One-half to three-quarters volt. C. D.—1 Amp. per sq. ft.

Black on Zinc

Water	1 gallon
Nitrate of Manganese	2 ozs.

Hardware Greens

Water	1 gallon
Hyposulphite of Soda	8 ozs.
Lead Acetate, Nitrate of Iron, or Nickel Sulphate	2 to 8 ozs.

Temperature 160 to 200 degrees Fahr.

French Bronze Color

Water	1 gallon
Copper Sulphate	1¼ lbs.
Chlorate of Potassium	1¼ "

Nickel sulphate also gives good results. Four to six ounces should be used. Temperature of solution 200 degrees Fahr. Best results are obtained upon copper or copper plated surfaces.

Ammonia Black Solution for Brass Goods

Water	2 gallons
Aqua Ammonia, 26%	1 qt.
Carbonate of Copper	16 ozs.
Sal Soda Crystals	8 "

Add the water last. Temperature 180 degrees Fahr.

Brown Colors on Brass

Water	1 gallon
Copper Sulphate	1½ lbs.
Potassium Chlorate	6 ozs.
Nickel Sulphate	3 "
Water	1 gallon
Sulphate of Copper	3 ozs.
Potassium Chlorate	3 "
Acetate of Copper	3 "
Hyposulphite of Soda	3 "
Water	1 gallon
Caustic Soda, 76%	3 ozs.
Polysulphide	2 "
Water	1 gallon
Sal Soda Crystals	16 ozs.
Water Ammonia	16 "
Acetate of Copper	16 "

Use all solutions at a temperature of 160 to 200 degrees Fahr. Immerse the articles, scratch brush and repeat when necessary to obtain desired tone.

Verde Green Solutions

For copper or copper plated articles, when dark verde greens are desired, oxidize the copper surface as desired before applying the verde solution.

Tiffany Green

Water	1 gallon
Sulphate of Copper	8 ozs.
Sal Ammoniac	8 "
Common Salt	4 "
Chloride of Zinc	1 oz.
Acetate Acid, 28%	2 ozs.
Glycerine	1 oz.

Mix in boiling water. Apply cold by immersion or brush. Repeat as desired to obtain color.

Water	1 gallon
Copper Sulphate	8 ozs.
Sal Ammoniac	6 "

*See Black Nickel Solutions by Joseph Haas, Jr., in THE METAL INDUSTRY, Jan.-Feb., 1921, pp. 23 and 73.

Acetic Acid	2½"
White Vinegar	6 "
Granular Rock Salt	6 "

Mix as above and use the same.

Verde Green to Apply with Brush to Copper, Brass, Bronze, or Oxidized Surfaces

Water, Hot	3 quarts
Muriatic Acid	1 quart
Verdigris	3 lbs.
Copper Carbonate	8 ozs.
White Arsenic Powdered	8 "
Sal Ammoniac	3 lbs.

Dissolve the arsenic separately in the muriatic acid by the aid of heat. Add to the water and the mix in other ingredients. All verde finishes should be lacquered and waxed to preserve the finish.

Sulphide of barium should be used in preference to sulphuret of potassium in producing rich shades of brown upon copper or copper plated articles. The same methods are pursued as in using sulphuret of potassium.

Flemish iron is produced upon imitation hammered iron work by coating with dead black Japalac, drying, then rubbing down with emery and a little oil. The surface is then acquired to protect against rust. This is used largely upon antique hanging lamps, old armor, etc.

Nitrate of iron gives better results in producing hardware greens upon cast brass or sheet metal goods than acetate of lead. The usual method is pursued of dissolving the nitrate of iron in hyposulphite of soda—one ounce of the iron in four to eight ounces of the soda in each gallon of water. Use hot.

In producing oxidized effects upon coffin hardware some consumers prefer the green gray tone. This is produced by using a weak solution of polysulphide of potassium to which is added a little ammonia and used only slightly warm. The articles are immersed without scratch-brushing until the green is produced.

The Old Brush or Colonial brass finish can be produced upon sheet brass goods without previous polishing in the following manner: Acid dip the goods in the regular manner and then brush them with a brass wire machine. Scratch-brush, moistening the articles with a little pumice stone and water. Then dry and lacquer in the usual manner.

When coloring up plain oxidized copper surfaces, after relieving, to produce the mottled effect, use Vienna lime on the buff. This gives a clearer color to the copper and the oxidize. Rouge compositions oxidize the relieved copper and give a reddish tinge to the black, necessitating the rewashing of the articles before lacquering. Vienna lime prevents this and the articles can be lacquered from the wheel.

The burnt brass effect upon brass-plated antique iron or other metals is produced by rubbing down with sea sand and water, then lacquering in the usual manner, then mix up burnt sienna or burnt umber with a little turpentine, linseed oil and copal varnish. The articles should dry for a short time, then be wiped out irregular to give the appearance of scouring away the burnt surface.

Imitation verde tones or any contrasting color can be produced by mixing dry colors in turpentine, using a little turpentine copal varnish, and mixing to the proper consistency and applying as stated before. These colors give opaque tones, providing too much varnish is not used. Then dry in fifteen minutes. All metals should be lacquered before applying. The colors dry into the lacquered surface, giving permanent results.

In producing dark bronze tones upon copper or copper plated articles, use in connection with the sulphuret of potassium a little sulphate of ammonia (this is a neutral salt) in the place of the water ammonia. A one-quarter ounce of the sulphuret and one-eighth ounce of the sulphate of ammonia dissolved in a gallon of cold water will be found an excellent solution for bronze tones. These bronze tones should be scratch-brushed dry with an old or very soft brush.

Brass articles when immersed in a hot solution, consisting of one-half ounce of golden sulphuret of antimony and four ounces of caustic soda in each gallon of water, become oxidized with a pleasing brown shade. This will become darker if immersed in a dilute solution of sulphate of copper, used cold about four to eight ounces to the gallon. Several immersions in the same manner give deeper brown tones; when relieved give very pleasing effects upon brass.

DIPS AND MATTS

It is well to note that aluminum dipping baskets cannot be used in potash solution or in muriatic or hydrofluoric acids. These chemicals dissolve aluminum very rapidly, while the strong mineral acids, such as sulphuric or nitric acids, have no perceptible action upon the metal.

To produce the matt surface upon articles made up from aluminum, first wash in benzine or gasoline, then immerse momentarily in a warm potash solution, then rewash and immerse in clear aqua fortis. This removes the oxide formed in the potash and leaves the metal clear and white.

In bright dipping small articles that would not pay to wire up, use aluminum dipping baskets with as large a mesh as possible. You will find that this is a money saver in acid in the course of a year. The acid has very little, if any, action upon the baskets. The acid runs away from the baskets more readily on account of the many exits furnished by the mesh.

Hydrofluoric acid pickles used in removing fire scale or sand from iron or brass castings when in use for some time, can have their action considerably increased by adding 2 or 4 ounces of sulphuric acid to each gallon of solution. This is also permissible when preparing new pickles. The small amount of free acid added produces a greater action upon the surface of the articles to be cleansed.

It is sometimes found difficult to produce a very bright luster upon sheet brass goods, even when the articles have been previously immersed in the regular aqua fortis firing off dip. This may be due to the composition of the metal. In such a case after the usual bright dip, reimmerse in the hot potash cleaning bath for a few seconds, then remove and allow to drain well. Do not wash in cold water as customary. Then plunge in the bright dip and remove as rapidly as possible, wash and dry out in the usual manner, a clear bright luster will result.

The best method to pursue in neutralizing the free acid in the pores of iron castings after pickling in hydrofluoric acid or any other acid, is to prepare a warm bath of commercial sulphate of ammonia. See that the articles are boiled out well in boiling water. They should then be immersed in the sulphate of ammonia solution for ten or fifteen minutes. This method will give a more satisfactory deposit especially when nickeling iron. Always add a little sal soda to the water in which iron or steel articles are immersed after cleaning or scouring while waiting for plating, this prevents oxidation.

Bright acid dips according to most text book formulas

should be prepared in the proportion of one part sulphuric acid to half part aqua fortis. These proportions work very well after the bright dip has been working for some time and needs replenishing. But such a dip when newly prepared according to the proportion mentioned produces an Ormolu tone to the surface. Bright dips for brass gives better results when prepared from the following proportions:

Oil of Vitriol	1 gallon
Aqua Fortis	1 "
Muriatic Acid	½ oz.
Water	1 qt.

For gilding metal, copper, or low brass two parts of aqua fortis to one part oil of vitriol should be used by measure, then add the muriatic acid and water in the proportion mentioned.

Always remove fire scale from copper, bronze or brass before bright acid dipping. Solution commonly used is:

Water	1 gallon
Sulphuric Acid, 66%	10 ozs.
Bichromate of Soda	1 oz.

Temperature 120 to 140 degrees Fahr.

To preserve the action of the bright acid dip, after removing the fire scale, dip the copper, bronze or brass articles in a nitric acid dip for a moment. Then dip directly in the bright dip.

Nitric Acid, 38%	1 gallon
Calcined Soot	½ oz.

To remove fire scale from iron or steel, without sulphuric acid or muriatic, use crude sodium bisulphate.

Water	1 gallon
Crude Sodium Bisulphate	1½ to 2 lbs.

Temperature 200 degrees Fahr.

Iron or steel can be electrically pickled with the same solution.

Use lead-lined tanks with burned in seams and anodes of heavy plate iron (the steel parts to be pickled becoming the cathodes). Use 10 volts and a high current. The scale will be removed instantly. Connect the positive current to the iron anodes. Carbon can be used. Temperature 180 degrees Fahr.

Paints or enamels as well as japans and lacquers can be removed from metal surfaces almost instantly in the same manner, i. e., electrically. Iron tanks should be used. The positive current should be connected directly to the iron tank. The articles from which the paints or enamels are to be removed become the cathodes. Use a voltage of 6 to 10 with a high current.

Water	1 gallon
Caustic Soda	6 to 8 ozs.
Soda Ash	6 to 8 "

Ormolu dips for brass should be prepared as follows:

Add all the oxide of zinc nitric acid 38 degrees will take up. It should have the appearance of a heavy white wash solution. Heat up the mixture by surrounding the receptacle with hot water. Then add sulphuric acid to regulate the matt finish.

Sulphuric acid in excess gives a velvet matt, so by varying the amount of sulphuric acid, coarse or fine matt finish will result. All brass articles should be bright acid dipped before matt dipping. After matt dipping and water washing use a dilute sodium cyanide dip to remove acid stains and even up the color.

Water	1 gallon
Sodium Cyanide, 96-98%	2 to 4 ozs.

Dip for removing Fire Scale from Sterling Silver

Water	1 gallon
Sulphuric Acid, 66%	1 pint
Bichromate of Soda	2 ozs.

Temperature 180 degrees Fahr.

To prevent fire scale in annealing sterling silver use 25% sodium cyanide, 25% common salt and 50% soda ash. It will be found that as low as 10% sodium cyanide will do, increasing the other parts proportionately.

Heat in a cast iron or steel pot to 1250 deg. Fahr. Immerse the silver until it becomes cherry red. Then quench in water. The silver will be uniformly heated and all danger of fire scale eliminated.

Electro Strip for Gold

Water	1 gallon
Sodium Cyanide, 96-98%	5 ozs.
Yellow Prussiate of Potash or Soda	4 "

The articles to be stripped should be the anodes.

Cathodes should be of sheet carbon. The action is just the reverse from plating. Use a hot solution with a strong current at 4 to 6 volts. Keep the articles agitated while stripping.

A similar method can be used for stripping plated deposits from articles that have failed. Nickel, copper, brass and silver may be readily stripped from any base metal in the following solution:

Sulphuric Acid, 66°	1 gallon
Water	1 pint
Glycerine	1 oz.

The articles to be stripped become the anodes. Cathodes may be of carbon, lead or copper.

Acid Strip for Nickel Deposit Upon Copper, Brass or Bronze

Sulphuric Acid, 66%	1 gallon
Nitric Acid, 38%	1 quart
Water	½ pint

Heat the solution. Avoid an excess of water. If the brass, etc., is rough after nickel is removed, add more sulphuric acid until the brass becomes smooth.

If the dip works slowly add small proportions of nitric acid. Small iron castings that have foundry sand burnt in them should be pickled by tumbling in a wooden oblique tumbling barrel. A solution of

Water	1 gallon
Hydrofluoric Acid	1 pint

will be found effective.

For removing oxide or scale from small articles of iron or steel tumble in a solution of

Water	1 gallon
Crude Sodium Bisulphate	8 ozs.

To cleanse and brighten small steel articles tumble in a solution of

Water	1 gallon
Soda Ash, 58%	2 to 4 ozs.
Sodium Cyanide, 96-98%	⅛ to ¼ oz.

To remove burs and rough edges, use boiler ashes and a little ash and water. Tumble until removed. For bright finish follow up after drying out with macerated leather to which is added a little Vienna lime.

Brass, copper or bronze articles may be tumbled in macerated leather and Vienna lime, or ball burnished, using neutral borax soap chips as a lubricant. Sodium acid phosphite is used to replace cream of tartar in tumbling operations.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulations

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Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

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ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number Beekman 0404..Cable Address, Metalustry

Vol. 19 New York, May, 1921 No. 5

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EDITORIAL

THE BUSINESS SITUATION

A recent indication that conditions are improving can be found in the statement of Mr. Archer Wall Douglas, chairman of the Committee of Statistics and Standards of the Chamber of Commerce of the United States, who writes as follows:

"The most significant and possibly most encouraging feature of the situation is that the automobile business seems to have been not dead but sleeping. There is a resumption of operations in a modest way by some factories which were shut down, but which now have orders in hand. Also there is increasing sale for used cars.

"There is a better demand for lumber, prepared roofing and paint, because of somewhat more building and construction. There is more building going on in the cities than in the country, and there will not be much construction of any description on the farms until another harvest, as this will show the farmer where he stands."

The large copper purchases of the Western Union Telegraph Company, which have amounted to more than 10,000,000 pounds since January 1, shows that at least one organization continues to need metal. The fact that all the remaining surplus brass cartridge cases in the possession of the War Department were disposed of is another encouraging feature. These cartridge cases, totaling over 14,000,000 pounds, were sold to a number of large consumers on the same basis as 30,000,000 pounds were sold to the Chase Companies, the Scovill Manufacturing Company, and the Bridgeport Brass Company. This removes once and for all a large quantity of metal which has been lying on the market for some time, and the fact of its consumption may react favorably on the market for copper within a short time.

FAIR MERCHANDISING

A bill has been introduced in the House of Representatives by Representative Clyde Kelly of Pennsylvania, to allow manufacturers to fix prices at which their products would be sold in all markets. The bill applies, of course, only to goods in interstate commerce. A similar law is in effect in Oregon. According to Mr. Kelly, the bill has the support of the American Fair Trade League, and of practically every state retail merchants association, the National Association of Manufacturers and many of the state manufacturers and wholesale associations. Its purpose is "to give the independent manufacturer with an identified product the right to file his trade-mark or brand with the Federal Trade Commission, as well as his price to the wholesaler and retailer. On such filing he would have the right to maintain the price of his article. If any person feels that the price is too high he may appeal to the Federal Trade Commission. The Federal Trade Commission may revoke the right to fix prices, but may not fix the price itself."

The bill opens a large field for discussion of the right of manufacturers to dictate the price of their product to the public. Recent court decisions seem to indicate that sentiment is against such procedure. We should like to know how the manufacturers of metal specialties feel on this topic.

WASTE IN INDUSTRY

Work is now going on, and in fact is near completion, under the Committee for Elimination of Waste in Industry of the American Engineering Council. The field work which was done in New York, New England and Pennsylvania, was completed April 1. Among the industries investigated were the metal trades and the reports will be awaited with great interest.

The task of this committe consisted of investigating into the great wastes in production: First from intermittent employment; second, from unemployment that arises in shifting industrial currents; third, from strikes and lockouts.

L. W. Wallace, executive secretary of the Council has stated that "men of broad experience, of clear concepts, of unbiased attitude toward labor problems, and representatives of managerial, consultant, educational and editorial activities were chosen. The purpose of the committee was first, to determine the cause of labor, material, and equipment waste in industry; second, so far as possible, to determine the extent of the waste from these causes; third, to suggest means for removing the causes."

To go into the methods outlined for this investigation would take more space than can be given here. The task is plainly Herculean, and the first impulse is to be skeptical of an attempt to attack problems so broad and of such long standing. However, examination of the carefully detailed method of attack and of the personnel of the committee would lead even the most skeptical to hope.

After all this committee is not made up of well-intentioned, sentimental, but experienced and perhaps even poorly endowed social reformers. It is an organization of men of national reputations and a record of tremendous jobs already accomplished.

Just what will be the results of their work no one can say. It would be rash to predict that it will be "successful," as the task of recommending measures to overcome the greatest of industrial problems is too great for complete "success" to be possible. It is certain, however, that whatever can be done, this committee will accomplish. Its membership consists of J. Parke Channing, chairman; L. W. Wallace, vice-chairman; Robert B. Wolf; J. H. Williams, H. R. V. Scheel, Fred J. Miller, Robert Linton, C. E. Knoeppel and Herbert Hoover. L. P. Alford, George D. Babcock, F. G. Coburn, Morris L. Cooke, Harrington Emerson, Ira N. Hollis and E. E. Hunt are also members of the committee.

METAL SHOP DANGERS

An interesting communication from the U. S. Public Health Service, throws light on a danger in foundries in addition to the common hazard from burns, gas, etc., which evidently has not yet been appreciated. Dr. W. H. Drury, after an exhaustive investigation in a large axe factory in Connecticut, shows that the death rate for a period of twenty years from tuberculosis among the workers in grinding and polishing shops is 19 per 1,000, and that for all other workers in the same mills (but not in the grinding and polishing shops), only 1.6. The

unusual feature of this discovery is not that grinding is a hazardous occupation, for this has been known for some time, but that the death rate of wet grinders was much higher than that of dry grinders. Figures show that there are perhaps ten times as many cases of tuberculosis in wet as in dry shops.

Dr. Drury's report recommends that dry grinding be substituted for wet and that proper exhausts be installed.

The general impression seems to have been that wet grinding was safer than dry. It will be decidedly worth while for foundries, grinding and polishing shops to take cognizance of this report.

The dealers and reclaimers of scrap have often been warned of the dangers of such material and the fact that extreme care must be used in handling them. A case quoted by the Oxy-Acetylene Industries, is that of an Ohio scrap yard, in which a workman was cutting bolt holes in a piece of angle iron, which he placed on a sheet metal drum. Unintentionally he pierced the shell of this drum causing an explosion of a gas which it had contained. The workman was killed. An inspection of the drum showed it had been airtight and had contained a substance resembling sulphur, but the dealer had purchased several of them as scrap material some time before without knowing at all for what they had been used.

The instance of a few months ago of the explosion of a piece of lead pipe in a New York scrap metal plant is another case in point. In addition to the classification of metals as to their type, composition, etc., their sources should be noted and precautions taken to avoid trapping, or keeping trapped gas.

CORROSION

The subject of corrosion of metals, as yet less known than it is generally desired to be, continues to receive the attention which it should. At the recent meeting of the American Electrochemical Society, an account of which is given in this issue on page 198, a feature was the symposium on corrosion. This symposium was most successful and conclusions were reached of the utmost value.

According to Dr. Colin G. Fink, it is generally accepted that copper bearing steel resists corrosion of the air better than commercially pure iron, but that in ordinary water or in acid it is not so strongly resistant. The discussions centered almost entirely on the corrosion of iron and steel. We hope for other meetings where the corrosion of metals will be a topic. The need of such work is evidenced by the great detail in the which the Corrosion Committee of the British Institute of Metals investigated condenser tubing.

Even though (as Dr. J. T. Thompson stated), it is often necessary to subordinate the quality of resistance of corrosion to more necessary qualities in choosing a metal for a particular purpose, nevertheless, corrosion is a subject of first rank in importance.

HARDENED COPPER

With frequency bordering on regularity, the metal world is informed that someone has discovered how to harden copper, that the copper of antiquity, and the methods of Tubal Cain himself have been unearthed. Even though again and again explanations are published of the fact that copper can be and is being hardened, this does not deter inventors.

At present there are two known methods of hardening copper, (1) alloying, and (2) working. Both are thoroughly known. The method of alloying can be eliminated at once, because the alloyed metal is no longer copper, but bronze or brass. The method of working is practiced daily in the manufacture of cold drawn tubing, and hard-drawn copper wire.

A common error, which those who handle copper fall into, is to mistake copper which includes oxides in solution for hardened copper. It is hardened, of course, but in such a way as to make it unsuitable for commercial use.

A copper that has the property of tin bronze, would be new and perhaps useful, but this would theoretically require hardening by heat treatment, which is known to be impossible.

BRITISH INSTITUTE OF METALS

On page 210 of this issue we publish some of the papers presented at the annual spring meeting of the British Institute of Metals. It is interesting and gratifying to note the growth of this body from 200 in 1908 to over 1,350. Such a growth can be due only to intensive work by the members and the obvious benefits of membership. An interesting feature of the Institute is the fact that it has several very strong local sections. We believe that to this can be attributed a great deal of the institute's growth and the excellence of its publications.

The field which the Institute has covered in the past has been largely the scientific, rather than the practical side of non-ferrous metallurgy. Nevertheless, a large number of papers have been delivered of the greatest value to practical foundrymen.

The Institute has made a place for itself among the scientific societies of the world and is now justly considered an indispensable organization. We wish it continued health and growth.

TAX PAYERS

An article in the Mining Congress Journal gives some very interesting figures on the sources of taxes paid to the Government. It states that corporations as a whole contributed over $3,150,000,000 and that of this total $2,112,044,810, or almost 67 per cent is paid by manufacturing industries. Of this the manufacturers of metals and metal products paid $1,003,031,267, or almost 32 per cent of the total paid by all corporations. This last was the largest amount paid by any individual subdivision. How much of it came from the non-ferrous industries was not stated.

The agricultural and allied businesses paid $12,741,714, about .4 per cent.

Mining companies contributed $191,364,377. However, this was paid by only 52 per cent of the companies engaged in mining. The other 48 per cent had no taxable net income. They reported deficits to the amount of $71,473,129. The largest mine tax payers were the coal operators with $76,961,211. They are followed by oil producing companies who paid $58,840,626. Copper follows with $9,871,937. Lead and zinc together total only a few thousand dollars less than copper and the other metals (except the precious metals) paid about the same amount as lead and zinc. It is very interesting to note that iron mines paid only $1,747,314. Whether this is due to the fact that the profits are so small or that the mines are too tied up with the steel producing companies that the accounts were sent in together, was not stated.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

MELTING BRASS IN CRUCIBLES

To the Editor of THE METAL INDUSTRY:

The natural desire on the part of those required to make a decision on the question of an electric furnace installation for brass melting, is to obtain comparative cost figures showing the cost per pound of melting with the electric furnace, oil or gas reverberatory and the crucible method. Yet such figures mean nothing unless they cover conditions and practice exactly similar to the conditions prevailing in the case under consideration. It might cost a foundry making occasional orders for special castings, 5 cents a pound whereas a manufacturer of valves who has standard patterns, molding machines and is operating under quantity production conditions can often show a cost of from ¾ to 1 cent a pound. The conditions in a foundry are entirely different from those in a casting shop of a rolling mill. Even in the casting shop melting conditions vary to a great extent; casting extrusion billets is an altogether different proposition from casting small bars of special alloys such as Phosphor-bronze, Nickel alloys, etc.

The following table, however, is offered as an indication of how comparative costs with the electric and crucible furnace, run. The figures on crucible practice were atually obtained in the casting shop of a rolling mill, and the cost figures on the electric installation were obtained from data published by different electric furnace manufacturers. The electric power rate varies, of course, very widely. Occasionally it is as low as 1 cent per K.W.H., but usually is about 3 cents per K. W. H. and very often higher.

ELECTRIC FURNACE

Production per day, \$10,000 lbs.
Alloy, "High Brass," 66% Copper.

Power	300 K.W.H. per ton, 1,500 K.W.H. at 3 cents..		\$45.00
Labor	1 Furnace tender at 7.00.....	\$7.00	
	2 Mold men at \$4.00.....	8.00	
			15.00
Zinc Loss	1% of 10,000 lbs. at 6 cents.....		6.00
Supplies	\$1.00 per ton.....		5.00
Repairs	\$1.00 per ton.....		5.00
	Interest and depreciation, initial investment, \$15,000. Interest at 7%, \$1,050. 250 working days		4.20
	Depreciation, 20% per annum. 20% of \$15,000, \$3,000. 250 working days.....		12.00
	or .922 cents per pound.....		\$92.20

CRUCIBLE PIT FIRES

Production	Per Day, 9,000 lbs. Set of Ten Fires. 5 Rounds, 50 Heats. Alloy-High Brass, 66% Copper.		
Fuel	3,600 lbs. of coal at \$11.00 per ton.....		\$19.80
Labor	1 caster at \$10.00.....\$10.00		
	3 men at \$5.....	15.00	
	....		25.00
Zinc Loss	1.3% of 9,000 lbs.—117 lbs. at 6 cents.....		7.20
Supplies	Crucibles, 3 at 7.00 (in carload lots this price would be considerably less).....		21.00
Repairs	50 cents per ton.....		2.25
	Interest and depreciation, initial investment, \$5,000. Interest at 7%, \$350. 250 days.		1.40
	Depreciation, 15%. 15% of \$5,000, \$750. 250 days		3.00
			\$79.65

\$79.65/9,000—.885 cents per pound.

It will be observed that in this case the cost per pound is considerably in favor of crucible melting. Cost figures, however, do not tell the whole story. There are many conditions where electric furnaces or any other type of large capacity furnace are not at all satisfactory, aside from purely cost considerations. It seems to me desirable to summarize the disadvantages here.

A. With few exceptions, all existing types of electric furnaces are reverberatory furnaces of fairly large capacity. The fact that electricity is the source of heat does not alter the fundamental type of the furnace nor does it materially add to its advantages. This fact is important and is generally lost sight of. The fundamental question is not the relative advantages of electric furnaces over all other methods of melting brass, but is really the relative advantages of the large capacity tilting furnace and the crucible method. The problem therefore really is an old one and existed long before electric furnaces.

Space forbids the presentation of the details of this old question but it may be stated without argument that the advantages of the crucible method over the large capacity reverberatory furnace for certain conditions are just as valid today as they ever were, even though the large capacity furnace is electrically heated. These advantages are flexibility and metallurgical control.

B. Cost of electrical equipment is from 3 to 15 times that of coal, oil or gas equipment.

C. Cost of power is usually several times that of solid and liquid fuels, and in dull periods, shut-downs, etc., the power contract runs on just the same with penalties and carrying charges (in figuring power costs, this point should be kept in mind.)

It is frequently claimed that the electric furnace eliminates ash handling and treating, high zinc loss, crucibles and defective metal. Ash handling is only necessary with coal pit fires. This disadvantage is also eliminated through the use of oil or gas for fuel, either in crucible or reverberatory furnaces, and elimination of ash handling is not peculiar to electric furnaces.

Zinc loss depends entirely on the concentration of zinc in the alloy, temperature and time, and the type of furnace or fuel has little to do with the problem. A badly designed installation whether electric or fuel fired, will certainly tend to increase metal loss but nine-tenths of it is due to the human element and the method of operation.

Crucibles are not required with oil or gas reverberatory furnaces, but the elimination of crucibles does away with all the well known advantages of the crucible process. Defective metal is almost invariably due to manipulation. Better metal can be obtained with crucible practice than with any other method of melting and that this is generally recognized is evidenced by the wide-spread use of the crucible process for the production of the best grades of non-ferrous alloys and steel.

Fuel conservation may not be of much interest to the individual manufacturer but the problem is certainly of vital interest to the nation and the choice of fuel and equipment for any industrial heating problem should be governed to some extent by the principles of conservation. It is unnecessary to elaborate in detail the waste of energy involved in the generation of electricity from coal for melting metals.

Improvement of crucible practice through the use of gas, of various types, in crucible furnaces will result in cheaper and better metal and will be much more in line with the broad principles of fuel conservation than electrical developments. There are other strong reasons for the use of gas fuel in the brass industry, especially in brass rolling mills. Gas is an excellent fuel for annealing furnaces and for steam boilers. If the size of the plant justifies the investment, by-product recovery can be practiced which means enormous reductions in fuel costs. The rapid increase in the use of gas and in the number of by-product coal plants in recent years, especially in the steel industry is a subject which brass manufacturers have badly neglected.

In conclusion, I believe that the furnace must be designed to suit the work; that it is not possible to sell standard furnaces for any purpose from stock, whether they are electric or fuel fired, and get the best results; that the use of electricity for heating, except in special cases, is not in line with fuel economy and conservation, and that the use of gas fuel offers great possibilities.

EQUIPMENT ENGINEER.

CYANIDE SORES

To the Editor of THE METAL INDUSTRY:

Some time ago we wrote to you making inquiry as to how we could prevent sore hands from the effects of the Cyanide solution, at which time, if we remember correctly, you suggested trying Bicarbonate of Soda.

We tried this without success and upon experimenting we discovered that if the hands are washed at the end of every day with benzine or naphtha this soreness is prevented. None of our men for many months have had sore hands.

We give you this information as it may benefit others that are troubled in the same way.

THE JOHN KRODER & HENRY REUBEL CO.

Brooklyn, March 18, 1921.

In answer to your letter of March 18:

Please accept our thanks for your courtesy and interest in letting us know about the beneficial results of the use of benzine and naphtha. It will certainly be useful to others who are troubled in the same way.

We might state, however, that so far as the writer knows, we have never advised the use of bicarbonate of soda. The things we have always advised are perborate of sodium, white vaseline and peroxide of zinc, as per the enclosed clipping from our issue of March, 1920, page 132.

THE METAL INDUSTRY.

March 21, 1921.

A WORD OF THANKS

To the Editor of THE METAL INDUSTRY:

Permit me to express my thanks and appreciation of your very prompt and complete answer to my inquiry of January 26, regarding the so-called Parkerizing process. The promptness and thoroughness which are manifested in this service can but add greatly to the already high value which your magazine holds for the trade.

Thanking you again, I remain,

THE RANDALL-FAICHNEY CO., INC.

By H. W. Toohey, Factory Superintendent.

February 7, 1921.

NEW BOOKS

The Condensed Chemical Dictionary, compiled and edited by The Editorial Staff of Chemical Engineering Catalog. Frank M. Turner, Technical Editor. Published by The Chemical Catalog Company, New York. Size, 6 in. x 9 in., 525 pages. Price, buckram, $5; flexible cover, $6. For sale by THE METAL INDUSTRY.

This book was compiled to fill a need felt by exporters, importers, brokers, jobbers, financial houses, lawyers, librarians, purchasing agents, insurance companies and others connected with chemical industries for information at hand for business purposes. The list of subjects below shows the scope of the work:

Names of Chemicals and Substances	Solubility
Uses	Materials from which they are made
Chemical Formulas	Grades
Colors	Method of Manufacture
Properties	Method of Purification
Constants	Shipping Containers
Specific Gravities	Fire Hazards
Melting Points	Railroad Shipping Regulations, Etc.
Boiling Points	

These facts are recorded about 7000 chemicals. Various tables are included. The book is useful not only to the business man but to the technical man as well.

Sheet Metal Drafting, by Ellsworth M. Longfield, published by McGraw-Hill Book Company, Inc., 330 Seventh avenue, New York. Size 6 x 9, 236 pages, 327 illustrations. Price payable in advance $2.25. For sale by THE METAL INDUSTRY.

This book, written by the head of the sheet metal department of the Boston Trade School, is one of the University of Wisconsin Extension Texts. It is adaptable for use in vocational, evening and part time schools. The subject of drafting for sheet metal work is gone into from the very bottom up. The student is explained the principles of simple drafting and projection. From there the work progresses to the laying out of simple metal forms, and then more complicated figures. Along with the explanations of methods are typical mathematical problems, which apply to each particular case.

The subject is carefully divided and subdivided so as to include special articles under their general headings. Thus, for instance, conical roof flange comes under cones of revolution, and the three-piece rectangular elbow comes under intersecting regular prisms.

The book is essentially practical, simply written and admirably suited for heads of metal working shops and metal workers who wish to add to their knowledge and improve their positions. The large number of illustrations are a decided aid to the reader in grasping the methods outlined.

Metal Statistics for 1921, published by the American Metal Market and Daily Iron and Steel Report, 81 Fulton street, New York. Size 4 x 6—560 pages. Price, payable in advance, $1.00 For sale by THE METAL INDUSTRY.

This is the fourteenth annual edition of Metal Statistics. There is little need to go into detail about the book, as it is well known to all manufacturers and users of metal products. It is an indispensable, handy reference book. The difficulties caused by the war have made it impossible to include all the figures of foreign production. Nevertheless the book contains all those of importance which could be collected. Those interested in metals will find the section beginning on page 279 of special usefulness, as it gives the data for the production and consumption of copper, tin, lead, zinc, aluminum, antimony, nickel, silver, gold, platinum, quick silver, magnesium and other metals.

GOVERNMENT PUBLICATIONS

Progress Report of the National Screw Thread Commission.—Miscellaneous Publication No. 42 of the Bureau of Standards, Washington, D. C. This report contains the findings and recommendations of the National Screw Thread Commission. It contains standards for screw threads, ascertained and established by the Commission.

Fuller's Earth in 1919.—By Jefferson Middleton, U. S. Geological Survey, Washington, D. C.

Sand-Lime Brick in 1919.—By Jefferson Middletown, U. S. Geological Survey, Washington, D. C.

Phosphate Rock in 1919.—By Ralph W. Stone, U. S. Geological Survey, Washington, D. C.

Magnesite in 1919.—By Charles G. Yale and Ralph W. Stone, U. S. Geological Survey, Washington, D. C.

Production of Rolled Zinc in 1920.—By C. E. Siebenthal and A. Stoll, U. S. Geological Survey, Washington, D. C.

Consumption of Primary Zinc in the United States, 1917-1920, in Short Tons.—By C. E. Siebenthal and A. Stoll, U. S. Geological Survey, Washington, D. C.

Mineral Production of France, 1913-1919.—U. S. Geological Survey, Washington, D. C.

Mineral Production of Trinidad, 1918 and 1919.—U. S. Geological Survey, Washington, D. C.

Mineral Production of the United Kingdom and Isle of Man, 1918 and 1919.—U. S. Geological Survey, Washington, D. C.

Zinc Produced in the United States, 1917-1920, in Short Tons.—By C. E. Siebenthal, U. S. Geological Survey, Washington, D. C.

Graphite Industry in 1920.—U. S. Geological Survey, Washington, D. C.

Coal in 1918. Part B. Distribution and Consumption.—By C. E. Lesher, U. S. Geological Survey, Washington, D. C.

American Industry in the War.—A Report of the War Industries Board, by Bernard M. Baruch.

Salt, Bromine, and Calcium Chloride in 1919.—By Herbert Insley, United States Geological Survey, Washington, D. C.

Mica in 1919.—By Herbert Insley, U. S. Geological Survey, Washington, D. C.

Tungsten in 1918.—By Frank L. Hess, U. S. Geological Survey, Washington, D. C.

Manganese and Manganiferous Ores in 1919.—By H. A. C. Jenison, U. S. Geological Survey, Washington, D. C.

Quicksilver in 1919.—By F. L. Ransome, U. S. Geological Survey, Washington, D. C.

Talc and Soapstone in 1919.—By J. S. Diller, U. S. Geological Survey, Washington, D. C.

Coke in 1918.—By C. E. Lesher and F. G. Tryon, U. S. Geological Survey, Washington, D. C.

Sodium Compounds in 1920.—U. S. Geological Survey, Washington, D. C.

Mineral Production of Italy, 1918 and 1919.—U. S. Geological Survey, Washington, D. C.

Losses in Aluminum and Aluminum-Alloy Melting.—Serial No. 2239. By Robert J. Anderson, metallurgist, Bureau of Mines, Washington, D. C.

Relative Safety of Brass, Copper and Steel Gauzes in Miners' Flame Safety Lamps.—By L. C. Ilsley and A. B. Hooker, Bureau of Mines, Washington, D. C.

Industrial Rehabilitation—General Administration and Case Procedure.—Bulletin No. 64, Industrial Rehabilitation Series No. 2, Federal Board for Vocational Education, Washington, D. C.

Mineral Resources of the United States in 1917.—Two volumes published annually. The volume on metals, which is particularly interesting to readers of THE METAL INDUSTRY, is a necessity for every producer or user of raw materials.

Technical and Scientific Literature

METALLOGRAPHIC ETCHING REGENTS: 1, FOR COPPER

Bureau of Standard Scientific Pages No. 399.

In the study of the microstructure of metals, the etching of the specimen is of fundamental importance. In the study of the general subject by the Bureau of Standards, copper was the first type to be considered. The principles underlying the etching of this metal are developed and it is shown that oxidation is of prime importance. A list of typical etching reagents is given and the relative value of the various reagents is shown by means of numerous micrographs illustrating the etching of various forms in which copper occurs.

A CLASSIFICATION OF SHEET METAL ENAMELS

Abstract of a Paper Delivered Before the American Ceramic Society at the Chemical Exposition, New York, September 24, 1920, by R. R. DANIELSON, Associate Enameled Metal Technologist, Bureau of Standards, Washington, D. C.

In this paper are given the compositions of typical enamels applied to sheet steel together with reasons for their use. It has not been intended to cover the field of possible composition, but it has been the purpose of the writer to present proven compositions which yield several kinds of commercial enamels and enable the makers of enamels to compare them with their own.

PAPERS OF THE BRITISH INSTITUTE OF METALS*

SOME NOTES ON CALCIUM

By P. H. BRACE

This paper gives a brief historical survey of the development of the metallurgy of calcium and describes a type of apparatus developed by the writer for the manufacture of the metal, which is obtained by the electrolysis of fused calcium chloride. The electrolyte is first melted by means of an alternating current and when a small pool has been formed, direct current is switched on and as the metal deposits on the cathode, the latter is slowly withdrawn from the bath. Further deposition takes place on this calcium, which itself is withdrawn at such a speed that a continuous rod of the metal is formed. A summary of the more important uses of calcium, including the preparation of certain aluminum alloys, is given in the paper.

PLASTIC DEFORMATION OF SOME COPPER ALLOYS AT ELEVATED TEMPERATURES

By Professor C. A. EDWARDS, D.Sc., and A. M. HERBERT.

The object of the investigation was to determine the plasticity of certain copper-aluminum and copper-zinc alloys at temperatures between 0°C. and 900°C. In most, if not all previous investigations dealing with this subject the observations have been made by means of one of the well-known methods of testing under static leads. In the present work, however, dynamic stresses have been applied by means of a falling weight to which was attached a 10 mm. steel ball. The degree of plasticity was calculated from the size of the indentations produced in the specimens by the ball.

The results obtained give unmistakable indications of pronounced changes in the plasticity of both series of alloys at temperatures which correspond with structural transformations that are known to occur in the respective series. It may seem rather curious that the same kind of evidence is not obtained when a static method of testing is used, but such appears to be the fact.

The difference in this respect is no doubt due to the influence of the time factor. With dynamic stresses the time factor is, of course, reduced to a minimum, whilst with the static method the best that can be done is to attempt to standardize this variable. When tests are being made at different temperatures, any particular standard rate of loading which may be selected will have the effect of introducing an additional uncertainty because the effect of time also varies with the temperature. Therefore, the static method of testing can scarcely be expected to give clear indications of a change of properties corresponding with a constitutional change in the metal. Further, the static method can only give results that are of real practical value where the materials are to be subjected to slowly applied stresses. The significance of this will be appreciated when it is remembered that in most commercial operations, such as forging, hammering, rolling and extrusion, the stresses are applied at phenomenally rapid rates. Hence plasticity determinations under dynamic stresses are much more likely to give data that are comparable with the above-mentioned practical operations than those from static tests.

*Read at the Annual General Meeting, London, March 9, 1921.

THE ACTION OF REDUCING BASES ON HEATED COPPER

By H. MOORE, O.B.E., B.Sc., Member, and S. BECKINSALE, B.Sc.

Specimens of copper containing different percentages of oxygen, together with specimens completely deoxidized and containing a small excess of zinc, manganese, aluminum, or phosphorus, were exposed to the action of different reducing gases at different temperatures and of varying lengths of time. A markedly injurious effect is produced even when the oxygen content of the copper does not exceed 0.026 per cent. In copper containing 0.07 per cent. oxygen the effect of reducing gases begins to be important at about 600°C. The lower the oxygen content the higher is the temperature required to cause similar injury. The higher the temperature or the longer the time of action of the reducing gases at any given temperature, the more deeply does the effect penetrate. Coal gas is intermediate between hydrogen and carbon monoxide as regards depth of penetration in a given time, but its actual weakening effect seems to be greater than that of either of these gases.

Copper containing a small percentage of zinc, manganese, aluminum or phosphorus is entirely free from globules of cuprous oxide, and is not affected injuriously when heated in reducing atmospheres. Copper prepared in this way is completely immune from injury even under the most severe conditions, e. g., six hours at 1,000 C. in a current of coal gas. Copper completely deoxidized with hydrogen when molten is equally immune from the injurious effect of reducing gases. For some purposes, other than electrical, an alloy of copper with 3 per cent. of zinc appears to be a better material than commercially pure copper.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research }

BRIGHT DIP CASTINGS

Q.—We made quite a quantity of small yellow brass fixture castings last year weighing about one-half ounce each. These were supposed to take a bright acid dip but quite a percentage of these would turn dark after dipping although various approved methods and solutions were tried.

The mixture weighed in was sixty-three pounds copper, thirty-seven pounds zinc and one and one-half pound lead. It was absolutely essential that the metal be poured exceedingly hot as we had a large number of castings in the mold and otherwise misruns would result. It was also essential that a cheap yellow brass mixture be used as the price was very close. We used a small amount of aluminum as a deoxidizer.

We are confronted with a similar proposition again and desire to know if you can tell us what is necessary to do in order to secure bright dip castings.

A.—We suggest that you use a mixture of 65 copper, 33 zinc, 2 lead and not over 1 ounce of aluminum to 100 pounds of metal, and water-tumble your castings with lots of slag, such as skimmings from the crucible or sweepings from around the chipping room. Then dip in aqua fortis acid to which 1 ounce of Scotch or German soot has been added, per gallon of solution. The acid is supposed to keep cooler by using this soot. Whether it is or not, it is used quite extensively in acid dipping brass goods. Then rinse in water and dip in the regular bright dip, consisting of sulphuric and nitric acid to which a handful of salt is added. Rinse in running water and dip in hot water and dry in sawdust. —W. J. R. Problem 2,941.

CASTING GOLD

We have the following inquiries, which we should be very glad to have you answer at your earliest convenience:

Q.—1. What is a good coating for the mold for 14 karat gold bars to keep them from blistering? A more or less permanent coating is desired, not one which would have to be renewed for every ingot.

2. What is a good cover to use in melting 14 karat gold? What would be the necessary composition to have it slightly gummy so that it will flow with the metal to the pouring lip, and then hold back and stay in the crucible instead of going over into the mold?

A.—1. You will find that pure lard is about the best coating for iron molds into which alloyed gold is poured. Lard oil, of course, is also good; but a better carbonized surface seems to result from pure lard. Any newly machined iron mold will give poor bars, until a proper lamination of carbon be deposited and minute air passages established. Any mold will need frequent dressing and oil swabbing if used continually.

2. As good a cover as you need in melting 14 karat gold, is good clean pulverized charcoal. The charcoal can be blown back by means of a light blow tube, if any tendency to flow into the mold is noted. The chacoal naturally holds to the sides of the crucible spout, after the clear stream starts to flow, and should a little follow over, no harm will be done.—H. D. C. Problem 2,942.

LIFTING SCRAP WITH MAGNETS

Q.—We would like you to advise us if you know of a lifting magnet that could be used in a plating solution to extract pieces of iron or steel that have dropped in the tank, by simply running this magnet along the bottom of the solution. What we have in mind is a magnet similar to that used in unloading iron ore, etc. from railroad cars but of course much smaller, which is attached to the house current.

A.—You can make your own electromagnet for removing articles of iron and steel from the bottom of the tank, or any electrician can make one for you.

All that is necessary is to take a steel rod long enough to reach to the bottom of the tanks, and large enough in diameter to be sufficiently strong and rigid. A wooden handle should be secured to one, and the other end bent to form a "T".

Several coils of waterproof-coated copper wire, of about 20 B. & S. Gauge, should be wound around one section of the steel rod and properly secured. The two ends of the copper wire should have connections, so that they can be connected to about four cells connected in series, or the wires may be connected to the anode and cathode poles of the plating tank.

The current should be controlled by a rheostat, so that the insulation of the wire does not become overheated.—C. H. P. Problem 2,943.

LIGHTING FIXTURES

Q.—The castings we are making are used for lighting fixtures and portable lamps. We are using an alloy of lead 85 per cent and 15 per cent antimony; we prefer to use a zinc alloy in its place, as it is much harder and stronger and takes a high polish. I have made up an alloy of 96 zinc and 4 antimony bismuth and sheet aluminum. Small castings from this alloy were quite satisfactory but larger ones could not be made from this alloy. Is there a formula that is generally used for such work; also a formula, if possible, that will give the metal about 15 per cent elongation? Also please advise the best way to reduce oxidizing of zinc.

A.—The zinc used for slush molding is Horsehead or Bertha Zinc. Other grades of zinc crack when used for such work. The class of work you are doing is very often cast in bronze molds and called slush molding. About 4 per cent of aluminum added to the zinc will make a nice finish.

For sand casting a good mixture is 95 zinc, 4¾ copper and ¼ aluminum. A mixture that will cast in sand and stand bending and that takes a nice polish is composed of 78 per cent zinc, 18 per cent tin, 4 per cent copper. The best deoxidizer for zinc is sal ammoniac.—W. J. R. Problem 2,944.

POT BRAZING

Q.—We have about 500 bells to pot braze made of sheet iron 18 to 26 gauge. We have tried dipping them in a crucible in which we melted old scrap bronze bushings and it worked fairly well.

We would like to know what would be the best metal and what flux to use.

A.—The proper method to use would be as follows: Take 50 parts copper and 50 parts zinc and melt them in a crucible. When melted stir well and take two pounds of 20 mule team boric acid and one pound of 20 mule team borax. Mix well and add to the molten metal and stir. Then dip your bells in the metal for about a minute. Then withdraw and shake and you will have a nice job.—W. J. R. Problem 2,945.

PROTECTIVE WAX

Q.—Can you tell me a good wax or grease that I can apply to metal pieces to protect bright parts from sandblasting? I have tried paraffin heated with gasoline but neither way works well. I have seen a green wax used on a cup but I could not find out what it was.

A.—It is possible that the green wax you refer to is prepared as follows. Melt together

10	Parts	yellow wax.
10	"	white rosin.
3½	"	spirits of turpentine.
¾	"	finely powdered verdigris.

When thoroughly melted and mixed pour into sticks. Use heavy waxed wrapping paper for the purpose.

It is possible that if you add stearic acid to the paraffin wax, which you have already tried, and a little tallow, you could prepare a wax that would answer your purpose. Try the following:

Stearic acid	1	part
Paraffin wax	1	"
Mutton tallow	¼	"

The air pressure would have to be as low as possible in sand-blasting to prevent cutting away of the wax.

If you cannot obtain white rosin then use a good grade of yellow rosin for green wax.—C. H. P. Problem 2,946.

RECOVERING WASTE OIL

Q.—Will you please furnish us with any information that you may have on the so-called "Reclaiming System" installed by large factories for washing the rags and wastes used for wiping off oil, polishing a surface, or whatever other purposes that you may know it is used for.

The reclaiming system besides furnishing the men with clean absorbent rags and wastes also reclaims the oil, a large saving is thus enjoyed. Formerly all this material was instantly burned to prevent fire.

A.—The method used in large industrial plants for reclaiming oily rags, cotton waste, etc., is as follows:

1st. All excess of oil is pressed from the rags.

2nd. The rags and waste are then placed in an automatic washing machine. There are several types of such washing machines made for industrial plants. The washing water is maintained at a temperature of 160 deg. to 180 deg. Fahr., and definite proportions of a combination of mild alkalies are used as the cleansing factor, such as causticised soda ash, etc. As very little oil remains after the rags have been pressed it is hardly worth while trying to recover the saponified oil held in solution by the alkali. The usual washing in water and drying follows.

The oil recovered by pressing can be filtered and re-used for certain purposes.—C. H. P. Problem 2,947.

SOLUTION OF METALS

Q.—Has there been anything printed on the subject of metals dissolving other metals, or put in another way, alloys absorbing other metal. If I melt an aluminum alloy called Aceiral in an iron ladle and stir with tinned spoon, the spoon will disappear and if the alloy is kept molten in the ladle long enough it will gradually harden, the melting point being raised by the iron taken up.

My problem is dope this Aceiral with other metal which will reduce the affinity for iron and prevent this corrosion, I have tried Ferro-zinc but it didn't seem to stop the action.

A.—We do not know of any books published which treat on the type of corrosion of which you speak, except general works on metals and alloys which include this material. However, THE METAL INDUSTRY has published, from time to time, material on the corrosion of alloys, and most all of the books on alloys have something on non-corrosive alloys.

The metal, that you are using, called Aceiral, is an alloy of magnesium and aluminum. When you stir this with a tinned iron spoon, the tin lowers the melting point of the iron, and the magnesium, iron and aluminum form a thermit action and the iron is dissolved. The well known iron thermit reaction, which is caused by mixing iron oxide and metallic aluminum and then igniting the mixture with magnesium, is similar.

Aluminum will take up iron even from an iron pot, though not very fast. What you should do, is to use a Nichrome stirring rod for stirring. Nichrome will last a long time, without showing any signs of corrosion.

There is no "dope", that you could use to prevent aluminum magnesium alloys from dissolving tinned iron.

A cast iron, low in sulphur and phosphorus, mixed with 5% nickel, will also last for some time.—W. J. R. Problem 2,948.

TINNING CAST IRON

Q.—Can you give us a method of figuring the cost of tinning cast iron? Is it possible to figure in such items as the cost of a moderately small plant, the men required and the cost per square foot of casting area?

A.—The cost of tinning gray iron depends largely on the method employed and the skill of those operating the plant. The price of the tin is of minor importance, as the coating is very light. The equipment for a plant is roughly as follows: pickling tanks, tumblers equipped with gas outlets, at least two furnaces of the type used for melting white metals, good sized earthen crocks, tanks for hot water and kerosene, also for clear cold water.

Not knowing the size or type of castings you wish to tin it will be impossible to state just what the plant will cost. A small to medium sized tinning plant should run fairly well under one man and a helper.

It is not possible to get a figure for cost per square foot of casting area.

We believe that it will pay you to get the most experienced man you can find for this job. It is essential that his experience should cover the tinning of gray iron castings, as it is altogether different from the tinning of other materials. We are told that a small tinning outfit might be installed for $2,500, but you can readily see that the figure means very little, as we have no idea of the size of your installation.

A recognized procedure for doing the work is as follows:

Pickle the castings in a solution of hydrofluoric acid to free them from sand. Then roll them in a barrel for a couple of hours in a solution of 60 gallons of water, one pint of hydrofluoric acid, and wash them off in clear water. Pass them through a solution of caustic soda, and then clear water again, into a bath of hydrofluoric acid momentarily, then into gray sal ammoniac and cut down muriatic acid. From there the casting is taken to the first kettle, which is called the "roughing kettle," and kept in it until heated to almost the heat of the molten tin bath. The castings are taken out and plunged into the finishing kettle of tin which is kept at a slightly lower temperature than the roughing kettle, and then into the bath of kerosene and lastly very hot water.—W. H. P. Problem 2,949.

TRANSPORTING SOLUTIONS

Q.—We have approximately 6,000 gallons of solution divided between white nickel, black nickel, zinc, brass and copper. Will you kindly advise us in your Shop Problems Column as to the advisability of precipitating metals so as not to transport such a large quantity of solution. If you think it advisable we would appreciate any advice or suggestions regarding the method.

A.—The method of precipitating the metal from your various solutions, as outlined, would be impracticable on account of the cost. It would be preferable to make entirely new solutions, if you are unable to transport the old ones in their present volume, to their new destination.

An entirely new nickel solution can be prepared for 12 cents a gallon, or a maximum cost of 18 cents if ¾ lbs. of single nickel salts be used per gallon. The actual value of nickel solutions, based upon 55 cents for nickel anodes, is from six to twelve cents.

As a rule nickel solutions do not work satisfactorily, after they have been disturbed, as they would be if transported in barrels, that might also contaminate them through residues of substances, for which they were previously used; it does not matter how thoroughly they might be cleansed.

Brass and copper solutions can be reduced in volume by boiling them down, but the strength of the sodium cyanide is considerably reduced by such boiling.

It would hardly pay to transport zinc sulphate solutions. Black nickel solutions can be moved without the same injury that white nickel solutions would suffer.

This question is for you to decide. As noted the approximate cost for a new nickel solution would be 12 cents per gallon. A cyanide copper solution would cost 20 cents; a brass solution, 30 cents; a zinc sulphate solution, 10 cents; and a black nickel solution, 16 cents.—C. H. P. Problem 2,950.

WAX RECORDING BLANKS

Q.—I will appreciate it as a great favor if you will kindly advise me at your earliest opportunity about what is the approximate composition of the wax recording blanks used in the phonographic industry.

A.—The composition of the wax recording blanks used in the phonographic industry is as follows:

Stearic Acid	59.5 %
Sodium Hydrate	8.5 %
Red Lead	6.4 %
Refindd Paraffin	25.6 %

Another formula which we have been told is in use is

Ozokerite	1 pound
Carnauba Wax	¼ "

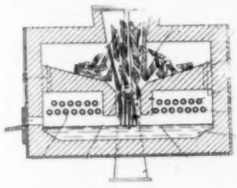
Both these mixtures require very careful cooling after melting. They must be cooled gradually in a warm pan in a warm room, as sudden temperature changes will crack them.—S. W. Problem 2,951.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

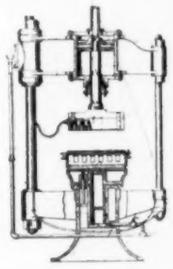
1,367,364. February 1, 1921. **Electric Furnace.** Abraham Marthinius Erichsen, Porsgrund, Norway.

The present invention relates to electrically heated furnaces, especially metal smelting furnaces, in which the principle of radiation, known from various kinds of reaction furnaces, is utilized, and in which electrical resistance bodies are arranged for that purpose above the charge of the furnace. In order to prevent the metal vapors and other gases, that will be formed in the furnace specially upon superheating of the alloy contained in the furnace, for instance brass, from penetrating and condensing in the openings in the furnace walls, provided for the free passage of the resistance bars, whereby the free movability of the resistance bars might be prevented and their durability reduced, the space above the charge is kept under a slightly reduced pressure during the smelting process. The vapors formed will then lose their tendency of penetrating into and out from the said openings, and in fact the external air—because of the slightly reduced pressure inside the furnace—will tend to penetrate through the bar openings and into the furnace so as to keep the said openings free.



1,367,079. February 1, 1921. **Molding-Machine.** William H. Nicholls, Brooklyn, N. Y.

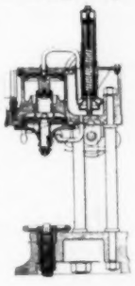
This invention relates to improvements in apparatus for forming molds and has for its general object the provision of means for jolting or jarring the sand in a flash, squeezing or compressing the sand about the pattern and then drawing the pattern from the mold by means of a reciprocable pressing head or plunger.



Another important object of the invention is to provide a molding machine with a reciprocable flask supporting and jolting member and a reciprocable pressing head adapted to be swung into and out of the path of the flash supporting member, electro-magnetic pattern drawing means being carried by said pressing head and adapted to engage the pattern plate during the pressing operation, and to draw the pattern plate and patterns from the mold as the pressing head is moved upwardly away from the flask.

1,367,133. February 1, 1921. **Apparatus for Making Rapid Tests of the Hardness of Metals.** René Guillery, Aubervilliers, France.

The present invention has for its object to provide an improved apparatus which will allow of obtaining, in the case where the time function varies within certain limits, a corresponding variation of the other function, namely the load function, which is produced automatically and inversely in such a manner that the impression produced in the metal which is a function of the load and of the time, will be constant irrespectively of the time duration.



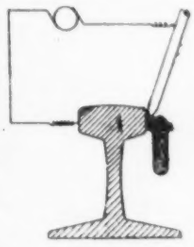
1,372,423. March 22, 1921. **Process of Case-Hardening Copper.** Adolph S. Gundersen, Oakland, Calif.

This invention relates to a process for the case hardening of copper.

An object of this invention is to provide a means for hardening the exterior surface or case of copper by forming an alloy upon the surface of copper with zinc which gives a brass surface, and to specifically provide a means for treating the same. While zinc has been used heretofore in the treatment of the surface of copper, the generic part of this invention is in the temperature used.

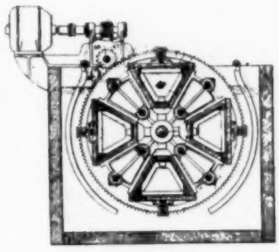
1,367,796. February 8, 1921. **Metal Working by Electricity.** Charles A. Cadwell, Cleveland, Ohio, assignor to the Electric Railway Improvement Company, Cleveland, Ohio.

It has been found that if to a pencil of ordinary commercial copper is applied a thin coating of an alloy reducing agent such as silicon or manganese copper, the weld or cast resulting from arc melting, such a pencil is better than if the reducing agent were alloyed uniformly throughout the body of the copper, the agent apparently being better situated for the work of protecting the copper against the action of the air when applied as an envelope. Boron carbid as a pencil coating is especially applicable on account of the fact that the superheat resulting from arc-melting is necessary to produce a reaction with this agent, while the fact that no slag results from its use adds to the superiority of this agent.



1,367,567. February 8, 1921. **Electroplating Machine.** Harry A. Sedgwick and Patrick J. Sheehan, Milwaukee, Wis.

This invention relates to electroplating machines.

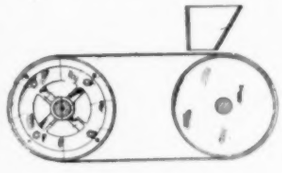


An object of the invention is to provide a machine of the character stated, of increased efficiency.

A further object is to provide a machine of the character stated which shall be capable of practically continuous action, and wherein the removal of the finished product, and the introduction of other material to be treated, may be accomplished during and without interruption of the plating operation.

1,369,516. February 22, 1921. **Magnetic Separator.** John F. Bethke, Milwaukee, Wis., assignor to Magnetic Manufacturing Company, Milwaukee, Wis.

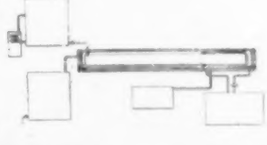
This invention relates to certain new and useful improvements in magnetic pulleys, and particularly such magnetic pulleys as are used in magnetic separators.



The objects of this invention are to produce a magnetic pulley, which will have a maximum efficiency or separating capacity for a given expenditure of electrical energy; which will be of minimum bulk and weight for a given separating capacity, and which can be economically produced.

1,369,451. February 22, 1921. **Method of and Apparatus for Reclaiming Spent Pickling Solutions.** Henry S. Marsh and Ralf S. Cochran, Youngstown, Ohio.

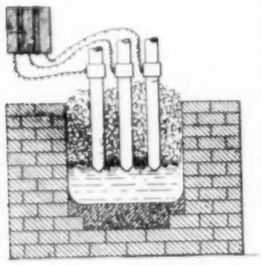
This invention relates to methods of and apparatus for reclaiming spent pickling solutions. The pickling operation, which is widely practised in the steel-making industry, being incidental to all sorts of steel-working processes, is essentially an operation in which the surface of an iron or steel article is cleaned of oxide, corrosion, or scale, and left bright. The operation is accomplished by submerging the coated article



in a bath of acid, ordinarily dilute sulphuric acid. Chemical reaction ensues, the underlying iron is attacked by the acid, and the oxide, corrosion, or scale is loosened and falls away, leaving exposed a clean surface of metallic iron. The chemical reaction produces a sulphate of iron ($FeSO_4 7H_2O$) known as copperas, which, being soluble, is from its formation carried in solution in the bath.

1,369,298. February 22, 1921. **Production of Ferro-silicon Aluminum.** William R. D. Penniman and Roy S. White, Baltimore, Md.

It is well known that an alloy or combination of aluminum, iron and silicon is on the market and is known as ferro-silicon aluminum. This combination is effected, however, by making in separate and distinct operations, ferro-silicon and metallic aluminum, which are afterward melted and compounded together to form the desired product.

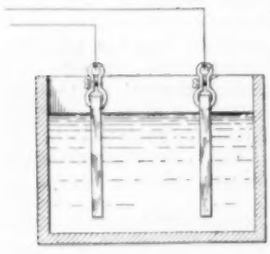


This invention comprises a new method of making an alloy of aluminum, iron and silicon which has evident advantages so far as cost and convenience of manufacture on a large scale are concerned.

The product of the process which is the subject of this invention contains on an average of from 15 to 20 per cent aluminum and is intended to include any per cent from 3 or 4 to 50 per cent.

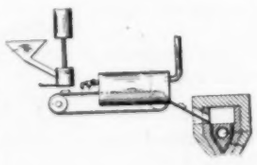
1,369,271. February 22, 1921. **Cleaning of Metallic Surfaces.** Thomas A. Edison, Llewellyn Park, West Orange, N. J.

This invention relates to the cleaning of metallic surfaces and more particularly to the cleaning of the surfaces of metallic objects electrolytically preliminary to subsequent treatment by which the surfaces so cleaned are coated with another metal or material, as, for example, in processes of electro-plating, amalgamating, tinning, galvanizing, enameling, etc., or in the process of coating such a surface with a thin layer or film of a selenide as described in the copending application Serial No. 305,821, filed June 21, 1919, and entitled Electro-plating.



1,370,090. March 1, 1921. **Method of and Means for Melting Brass and Similar Scrap.** Walter R. Clark, Bridgeport, Conn., assignor to Bridgeport Brass Company, Bridgeport, Conn.

In the melting of brass and similar scrap, good results have been obtained by the electric furnace of the induction type, having a secondary consisting of a part of the molten metal of the charge, located adjacent the bottom of or below the main body of the charge, and so arranged as to promote the circulation of the charge by motor effect. Certain difficulties have, however, been encountered in the handling of the scrap to be fed into the furnace, and it has been found, moreover, that the cost of melting metal in a furnace of this kind is rather high.



The primary object of the present invention is to provide a new method of and means for melting brass and similar scrap, whereby these objections are obviated, and the operation of the furnace facilitated, improved and made more efficient.

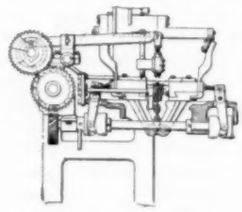
1,369,818. March 1, 1921. **Alloy.** Tatsuzo Kosugi. Seido-Mura, Kobe, Japan.

The present invention relates to an alloy comprising copper, aluminum, nickel and iron and has for its object to obtain an alloy having a great tensile strength, not easily susceptible of corrosive action of air or brine. Another object is to obtain an alloy in which blow holes and flaws are not produced by casting and forging operations.

In the present invention copper is used in preponderating amount, together with aluminum, nickel and iron.

Nickel and iron are first mixed in a crucible, melting them by heating, and then copper is added to the molten mass. After heating the mixture for a while aluminum is added thereto. When the whole matter is melted, the molten mass is poured into molds to form objects of any desired shape, as in ordinary metal casting.

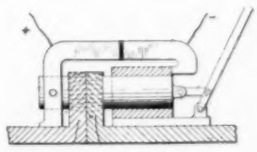
1,370,926. March 8, 1921. **Electric-Welding Method, Machine and Welded Chain.** Frank E. Stahl, of Tonawanda, New York, assignor to the Columbus McKinnon Chain Company, of Columbus, Ohio, a corporation of Ohio.



This invention relates to electrically welded chains and a method of and a machine for electrically welding the chain links.

An important feature of the present invention, therefore, consists in a method of electrically welding the chain links with the formation of the bulge, and preventing the bulge formation at the exterior of the link.

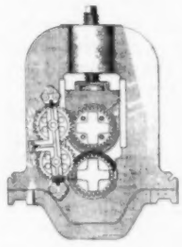
1,370,987. March 8, 1921. **Apparatus for Electrically Welding Plates.** Thomas E. Murray, Jr., of Brooklyn, N. Y.



The invention relates to the electrical welding of metal plates of large area, such as are used for ship-building, and consists in the apparatus as more particularly hereinafter set forth.

In combination with two plates having edge flanges, the outer faces of said flanges being in contact, means supported on said plates for welding together said flange faces.

1,370,998. March 8, 1921. **Rolling-Mill.** Henry A. Roemer, of Canton, Ohio.

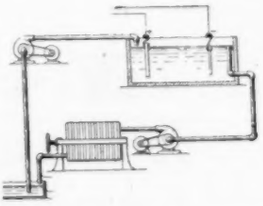


This invention relates to rolling mills and more particularly to the driving mechanism for balance roughing mills such as are used for roughing or rolling sheets, bars, plates or slabs in sheet, tin, jobbing and plate mills.

The objects of the invention are the provision of a driving mechanism for driving the upper roll of a balance roughing mill from the lower roll, regardless of the distance apart the rolls may be.

1,371,414. March 15, 1921. **Nickel-Plating.** Thomas A. Edison, of Llewellyn Park, West Orange, N. J.

In plating nickel electrolytically, it has, up to the present time, been customary to employ a solution of nickel ammonium sulfate for the electrolyte or plating bath of the electrolytic cell. Nickel-plating with such a cell is a comparatively slow process, due to the fact that the strongest solution of nickel ammonium sulfate it is possible to obtain is a 7% solution, with the result that the cell will carry only a weak current and the nickel is therefore plated out of the solution only at a very slow rate.



The principal object of this invention is to provide an improved process and arrangement, whereby nickel plating electrolytically may be carried on at a much greater rate than has heretofore been practicable.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

A LARGE JOB PLATING PLANT

In the Middle West can be found many splendid electroplating departments, connected with the great industrial plants, but as a rule the job plating plants are a conglomeration. The work to be finished is so varied that it is not possible to specialize in any one line.

The Sterling Electroplating Company of Chicago made an innovation when they installed the splendid plating plant at 1517-23 Carrol avenue, and specialized in the various lines to meet the demand of metal goods manufacturers who do not maintain their own plating departments. They realized that many metal goods manufacturers run their plating rooms at a loss, either because they do not have sufficient to do to keep their plating departments in constant operation, or purchasing plating materials upon a small scale proves a costly proposition.

In many instances they preferred to have their plating done outside, but were unable to find a jobbing shop large enough to do all their work and give them service at a price consistent with the selling price of their goods.

In the large modern plant of the Sterling Electroplating Company, they can find all these advantages at their disposal with a polishing department covering a floor space of 5,000 square feet, with lathe capacity for 36 polishers, splendidly lighted, with sanitary conditions, and a plating department splendidly equipped. Five thousand gallons of nickel solution are maintained in constant operation for all classes of metal goods. The nickel plating of die castings is one of their greatest specialties. A number of special tanks, with mechanical agitators, are maintained for this class of work.

Gold, silver, brass and copper plating are also done upon an extensive scale.

THE BART REFLECTOR

The Bart Reflector is an outgrowth of the war which was directly responsible for the development of many ingenious devices, chemicals, etc., now commercially possible. The Bart Process of reflector manufacture consists, generally speaking, of the deposition of metals, which, while not new in a broad sense has new features that permit of volume production on a commercial scale and a product that is high in reflectivity.

Hand or machine polishing is entirely eliminated, the reflector receiving its highly polished surface from the face of the mold, upon which the silver is applied. The silvered mold is placed in a copper plating bath and copper is deposited upon the silver to the required thickness, after which the reflector is removed from the mold; it is then trimmed and parts added.

The method of applying the silver to the mold and the elimination of waste in this metal are two important cost features that the Bart process is said to have overcome. The report of the U. S. Army Engineers on Searchlight investigation gives Mr. Bart much credit for his work as may be noted in the following paragraph taken from the department's history:

"Mr. Blasius Bart is especially commended for his ingenious work in connection with the manufacture and backing of metal searchlight mirrors. He made wonderful advances in the art of manufacturing metal searchlight mirrors and was the first who successfully applied transparent coatings to their reflecting surfaces.

Reflectors of large diameters having been previously manufactured of glass with its incumbent breakage and weight are now being manufactured in metal under the Bart process by the Bart Corporation, whose offices and salesroom are located at 17 West 50th street, New York City.

PLATING PLANT OF THE STERLING ELECTROPLATING COMPANY, CHICAGO

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

NATIONAL METAL TRADES ASSOCIATION

The vital importance of foreign markets to the metal trades of the United States was pointed out by Jerome Thralls in an address before the National Metal Trades Association. at the Hotel Astor. Mr. Thralls is the newly-elected executive vice-president of the Foreign Trade Financing Corporation, which was organized to promote foreign trade through credits.

Mr. Thralls called attention to the fact that close to a thousand million pounds of American refined copper is unmarketed because of credit conditions. This, he said, represents a half year's output. He added:

"This accumulation and the strong financial position of the United States makes it imperative that adequate financial machinery be established and put into operation at the earliest possible moment."

SOCIETY FOR TESTING MATERIALS

The twenty-fourth annual meeting will be held in the New Monterey Hotel, Asbury Park, N. J., from June 20 to 24, inclusive.

BRIDGEPORT BRANCH, A. E. S.

At the last regular meeting of the Bridgeport branch it was voted not to hold the annual banquet this year because of business depression, etc.

It is planned to have an outing of some sort later in the year, to make up the loss of the banquet.

CINCINNATI BRANCH, A. E. S.

The Cincinnati branch is holding its meetings at the Hill & Griffiths Company laboratories, 1162 State avenue, on the first and third Friday of the month, at 8 p. m. The attendance has been good.

INDIANAPOLIS BRANCH, A. E. S.

The branch held its regular meeting April 9, with President Hennessey presiding over a good attendance. It was decided that we increase our dues to $6 per year, beginning June 1, 1921. One application was received, one member was reinstated and one member was suspended. After the convention committees reported, the subject of bringing the ladies together on the convention was brought up and it was decided that we hold a meeting Friday, April 15, and bring the ladies along.

NEW YORK BRANCH, A. E. S.

President Sterling presided at the March meetings of New York branch. A membership investigation committee was appointed by the president, to investigate qualifications of new applicants. The following problems were discussed:

The production of a black deposit on steel with ammonium nitrate. Best method for burnishing small nickel plated parts. The composition of a black dip for lead antimony.

PROVIDENCE-ATTLEBORO BRANCH, A. E. S.

A largely attended open meeting in the interests of the membership campaign which was proposed at the annual dinner held some weeks ago, was held recently by the Providence-Attleboro Branch of the American Electro-Platers' Society. The meeting was held at 98 Weybosset street, Providence, and fully one-third of the large gathering were non-members, among whom were a number of employes, who manifested considerable interest in the proceedings and discussions. A number of applications for membership were received as a result of the meeting and were referred to the investigation committee to be reported upon at the next regular meeting of the society.

The meeting was presided over by Dr. Albert W. Claflin, of George L. Clafflin & Co., honorary president of the Providence-Attleboro Branch, who, in welcoming the assembly, gave a brief historical sketch of the organization, its aims and objects and its methods of research and exchange of investigations. He pointed out that the society was purely educational and that it was in no sense a labor organization and had no affiliation with any labor body. Its meetings, he said, which are held twice a month, are devoted to an exchange of information concerning new processes or developments in electro-plating, and the study of trade and industrial problems. He called attention to the Monthly Review and referred to the frequency with which articles and communications from members of the Providence-Attleboro Branch appeared therein, commenting especially on the February number, in which he said the contributions were almost entirely from members of the local society.

Alphonse Mackie, president of the Boston Branch, who is in charge of the gold and silver plating department of the Boston Plating Company, was introduced as the speaker of the evening and talked at considerable length upon the advantages of the educational discussions concerning electro-plating processes and problems, and the beneficial results accruing to the members of the society through this interchanging of ideas and the advancement from a scientific as well as from a practical standpoint that is being made through investigations, experiments and application. He also spoke of the advantages of such study and investigation to the employers and employes in the improved methods and the stricter economy that follows. He also outlined the growth and usefulness of the society. Following his addresse he devoted nearly an hour in conducting an informal question box, during which numerous technical problems in connection with electro-plating were discussed.

At the conclusion of the business session a buffet luncheon was served under the auspices of the entertainment committee.—W. H. M.

BRITISH INSTITUTE OF METALS

A joint general discussion on the failure of metals under internal and prolonged stress will be held in the hall of the Institution of Mechanical Engineers, Storey's Gate, St. James Park, S. W. 1, on Wednesday, April 6, 1921, from 2:30 to 10:30 p. m., by the Faraday Society, the Institution of Mechanical Engineers, the Iron and Steel Institute, the Institute of Metals, North-East Coast Institution of Engineers and Shipbuilders, West of Scotland Iron and Steel Institute, and the Institution of Engineers and Shipbuilders in Scotland.

I.—PAPERS OF A GENERAL CHARACTER.

1. Professor C. H. Desch.—"Chemical Influences in the Failure of Metals under Stress."

2. L. Archbutt.—"Failure of the Lead Sheathing of Telegraph Cables."

3. Dr. W. H. Hatfield.—"Mechanism of Failure in Metals from Internal Stress."

4. J. C. W. Humfrey.—"Internal Stresses in relation to Microstructure."

5. R. H. N. Vaudrey and W. E. Ballard.—"Internal Stresses in Brass Tubes."

6. Dr. F. Rogers.—"Effects of Prolonged Stress on Metals at High Temperatures."

7. R. W. Woodward.—"Corrosion-cracking of Non-Ferrous Materials."

II.—PAPERS DEALING WITH CAUSES OF FAILURE OF BRASS AND STEEL.

8. Sir Henry Fowler, K.B.E.—"Notes on Fractures in Locomotive Boiler Tubes."

9. D. Hanson.—"Intercrystalline Failure in Steel."

10. J. A. Jones.—"Intercrystalline Cracking of Mild Steel in Salt Solution."

11. H. S. Rawdon.—"The Presence of Internal Fractures in Steel Rails and Their Relation to the Behavior of the Material Under Service Stresses."
12. H. Moore.—"The Season-cracking of Brass: Digest of published Information."
13. H. Moore and S. Beckinsdale.—"The Removal of Internal Stress in Brass."
14. O. W. Ellis.—"Experiences of Season-cracking during the War."
15. Dr. F. Rogers.—"Stress and Season-cracking in Cold Worked Brass Articles."
16. W. C. Hothersall.—"The Spontaneous Cracking of Necks of Small Arm Cartridge Cases."
17. John Arnott.—"Note on Phosphor Bronze Bars."

The Birmingham Local Section of the Institute of Metals has re-elected as its chairman, Dr. H. W. Brownsdon, Chief Chemist to the King's Norton Metal Company, Limited. At the Annual Meeting it was stated that the preparations for the Autumn Meeting of the parent Institute which will be held in Birmingham are well advanced.

BRITISH METALS RESEARCH ASSOCIATION

At the annual meeting of the British Non-Ferrous Metals Research Association, held in London on April 15, the chairman (Mr. T. Bolton) stated that the Bureau of Information was doing valuable work, including the issue of a quarterly bulletin to members. The first research was that on brass and copper castings, which was taken over from the Brass and Copper Tubes Association in April, 1920. It was completed in September and the report contained much useful practical information. The research on atmospheric corrosion, which was initiated by the Royal Institution of British Architects and the Institute of Metals, had also been transferred to the association, and was being carried out by a strong joint committee. A researcher had been appointed and the work would be done at the Imperial College of Science and Technology, South Kensington, under the supervision of Prof. H. C. H. Carpenter. Technical committees had been appointed and on their recommendations researches had been put in hand (1) on the effect of foreign substances up to 1 per cent. in copper, and (2) on so-called "nickel-silvers." The former was being conducted at the National Physical Laboratory under Dr. W. Rosenhain and the latter at Sheffield University under Dr. F. C. Thompson. Collaboration with the scientific Instrument Research Association in an investigation into abrasives and polishing powders was also under consideration.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

M. M. Mayer, formerly manager of the plating and polishing supply department of the Warren Products Company, has established an office at 64 University place, New York, and entered the supply field on his own account. He will handle a full line of plating and polishing supplies.

Robert D. Seidel was elected president of the R. B. Seidel, Inc., Philadelphia Black Lead Crucible Works. Mr. Seidel succeeds his brother, the late Henry C. Seidel, who died February 12. The crucible works has been in continuous operation for 55 years. The founder, R. B. Seidel, father of Henry and Robert Seidel, died in 1892.

Victor T. Goggin, formerly New England sales manager of Fred T. Ley & Company, Inc., of Springfield, Boston and New York, has severed his connection with that concern to associate himself as contracting engineer with Dwight P. Robinson & Company, Incorporated, of New York, Chicago, Dallas, Youngstown, Los Angeles and Montreal.

John J. Swan has become associated with the Engineering Business Exchange of New York City and has removed there from Indianapolis, resigning his position with the Prest-O-Lite Company, which he has held for two years past. Mr. Swan graduated from Cornell in 1897. He was for a time one of the editors of Engineering News and later held important engineering and executive positions with well-known industrial companies, including the Ingersoll-Rand Company, the Longmead Iron Company, and the Chicago Pneumatic Tool Company. During the war, Mr. Swan was commissioned as a lieutenant-colonel of the operations division of the general staff.

John P. Mallett has recently become affiliated with the Connecticut Dynamo and Motor Company, of Irvington, N. J., and is in charge of the engineering department. Mr. Mallett has had many years' experience in special electrical engineering work. He was for six years designing engineer for the Westinghouse Electrical Manufacturing Company and for eight years chief engineer of the Northern Electrical Manufacturing Company. During the last few years he has been engaged in consulting engineering work, devoting most of his time to the designing of special electrical apparatus. During the war he volunteered his services to the government and received the commission of major.

John B. Fay, formerly associated with Mr. C. G. Backus in charge of the New York sales office of Munning-Loeb Company, and for the past four years Philadelphia manager of A. P. Munning & Company (successor of the former company), announces that he has oganized John B. Fay & Company, Inc., and has leased the properties at Nos. 428 and 430 Sansom street, Philadelphia. Mr. Fay has associated with him, Edward T. Homan, who, for twelve years past, has been supervisor of the various metal finishing departments of the Welsback Company at Gloucester, New Jersey.

John B. Fay & Company, Inc., will represent several of the largest manufacturers of plating and polishing apparatus and supplies in the country and will carry at the above address, for the convenience of the trade, a complete and large stock of all items used in those lines and their kindred trades. In addition to the items handled exclusively by Mr. Fay in the past he will have lacquer, etc., thus completing the list.

DEATHS

PETER H. LOCKLIN

Peter H. Locklin, Sr., head of the firm of P. H. Locklin & Sons, goldsmiths, at 36 Gold street, New York, and active in the jewelry trade in that city for forty-five years, died at the home of his daughter in Cranford, N. J., in his seventy-fifth year. Mr. Locklin was formerly associated with his brother, Frank P. Locklin, in the manufacture of gold and silver novelties, under the firm name of F. P. Locklin and Brother, but he resigned from this partnership in 1892 and formed a new one with his sons, Peter H. and John L. Locklin as members.

CORNELIUS A. HAMMOND

Cornelius A. Hammond, 82, a native of Torrington and for many years employed at the Coe Brass plant, died April 11 at his home in Seymour, Conn. Death was sudden, due to heart disease. Mr. Hammond was a son of Nathan and Harriet Hammond and lived in Torrington until 32 years ago when he went to Seymour to become superintendent of the wire plant of the Seymour Manufacturing Company. He was a veteran of the Civil war, a Mason and a Knight of Pythias. In 1906, he served in the legislature and at various times had held other public offices. His wife, one daughter, Mrs. Elizabeth Maybury of Seymour, and one son, Harry A. Hammond of New York, survive. The body was brought to Torrington for burial.

AMBROSE MONELL

Ambrose Monell, of 14 East Sixty-second street, New York, after whom Monel Metal was named, and who resigned the

presidency of the International Nickel Company in 1917 to become a colonel on the staff of the commander of the American aviation forces in France, died, age 47 years, at a sanitarium in Beacon, N. Y., of nervous prostration that had endured for several months. It is thought not unlikely that his breakdown was due to his work overseas. Since the war he had not returned to active business life, though retaining his directorships in the American International Midvale Steel, International Motors, International Nickel and other corporations.

AMBROSE MONELL

JOHN J. BELLOWS

John J. Bellows, superintendent of the plant of the Improved Seamless Wire Company, of Providence, R. I., of which he was one of the original incorporators, died at the home of his son in Providence, R. I., on Wednesday, April 20, in his 74th year. He was born in Greystone, R. I., May 25, 1847, and on May 12, 1864, enlisted as a member of the United States Signal Corps and was in active service at Washington. He was one of those who signaled the news of President Lincoln's assassination, by flaming torches.

Upon returning to Rhode Island at the termination of his service in the war he became a machinist and later was employed as a tool maker by various manufacturing jewelry concerns of this city and the Attleboros. In 1895 he was an incorporator of the Nelson Wire Company which, in 1898, was changed to the Improved Seamless Wire Company, being its superintendent from the inception until the time of his death. At one time he was treasurer of the corporation.

JOHN BORKEL

John Borkel, whose death was noted in our March issue, was born in Alzey, Germany, February 18, 1844, and after receiving a public and high school education came to this country in October, 1858. After his arrival he engaged as a metal worker in the large shipyards in New York, and right after the Civil war, when shipbuilding ceased, he turned his attention to metal cornices. While engaged at this, he became foreman for Messrs. Connelly and Wilson, 46 Rose street, New York, one of the most prominent firms in that line in those days. In 1868, he succeeded the above firm. From the time he became the possessor of the firm's cornice works he greatly improved the mode of manufacturing cornices and other ornamental work, and introduced principally copper for ornamenation of first class residences and churches. The copper and bronze work on the Vanderbilt building, the bronze doors for Grant's Tomb, the large mercantile building corner Waverly place and Broadway, the American Lithograph Company's building, 19th street and Fourth avenue, also the Germania Bank building, are a few of the places in New York that contain samples of his original designs in copper work. The Lorillard Estate, the Horace S. Ely Estate and many of the large trust companies are a few of the names he carried on his books for the past 52 years. The business that was started in a modest way in 1835, he carried on successfully until his death. One of the outstanding features of his career was his ability to choose loyal employees, which is evidenced by the fact that a number of them were in his employ during his entire business career.

JOHN BORKEL

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

MAY 2, 1921.

Business conditions in Waterbury remain practically unchanged at the present writing, with the exception of a report that the local branch of a New England watch concern, which has been shut down for several weeks, will reopen on full time on May 9. The city government, following the lead of a number of other cities, has taken steps to find temporary employment for the neediest cases of those suffering for lack of work by rushing city improvement work. At least 500 unemployed have thus far obtained work through this plan.

The Chase Company, one of the three large brass concerns of the city, has put a 10 per cent. cut in wages in effect, besides increasing the working hours of its office help to 10 hours. This cut in wages was followed, two weeks later, by a reduction in rents of all property which the company owns. About 120 families were affected by the reduction in rents. The reduction was made in spite of the fact that the company did not materially raise its rent schedule during the war.

During the month the cost of living committee of the **Waterbury Chamber of Commerce** presented an exhaustive report to their directors, the sum total of which was to the effect that the cost of living in Waterbury has dropped 11.4 per cent. since March 1, 1920. This is the first decrease in the living cost in Waterbury since 1914. Rents, according to the committee's report, have dropped about 6 per cent.

Estimates as to the number of unemployed in Waterbury

at the present time vary. In a recent report made by the state chamber of commerce Waterbury was credited with having 5,000 idle workers in the city. This estimate is borne out approximately by individual reports from the various manufacturers of the city. In addition to the 5,000 without work of any kind, there are perhaps three times that number whose pay envelopes are affected by a short week, or even only periodic employment.

THE FRANKLIN STATUE

Very much akin to the last trip made by the famous Liberty Bell is the trip which the now famous **Paul W. Bartlett** statue of **Benjamin Franklin** is making from Baltimore to this city, where it will be placed in the most centrally located park.

The statue is the result of a bequest of the late **Elisha Leavenworth,** of this city, the commission of designing of it having been given to the sculptor Bartlett in 1914. The war curtailed his progress on the statue for the time being, however, and it was not until the early part of April that the statue was ready for shipment.

The statue was cast in bronze by the **J. Arthur Limerick Company,** of Baltimore. Under the auspices of the Sons of the American Revolution a trip by truck was put into effect and now the statue is making a triumphal journey throughout the east. About 5,000 people participated in its departure exercises at Baltimore. Since then, during the past few weeks, celebrations of a patriotic order have been observed in a dozen or more cities, with only a third of the trip completed.

The statue is retracing the famous journey of Franklin, the boy, when he left his native city of Boston to go to Philadelphia. Those in charge are receiving the co-operation of the Army, the Navy, and scores of patriotic organizations along the route. At the special permission of Assistant Secretary of the Navy Roosevelt, a lighter has been placed at the disposal of the committee to convey the statue from New York to Boston, when it will again resume its journey by truck along the Boston Post Road through Providence to New Haven and thence to Waterbury. Both Harvard and Yale are preparing special celebrations in honor of the bronze replica of America's greatest diplomat.

The increasing homage that is being paid to Franklin's statue is materially delaying its final arrival in Waterbury, which is planning a reception even more spectacular than those of other cities through which the bronze has passed. The original committee for its reception, feeling unable to do the occasion justice has asked the Waterbury Chamber of Commerce to take complete charge of the reception and unveiling. Present plans indicate a ceremony approaching a holiday in character and that the city will practically turn out en masse to pay a proper tribute.

Contrary to reports circulated in the various cities through which the statue has already passed, the statue is not to be placed on Waterbury's green. The final resting place will be in Library Park, adjacent to the City Hall.—H. G. N.

TORRINGTON, CONN.

MAY 2, 1921.

Henry S. Washburn, secretary of the **Turner & Seymour Manufacturing Company,** and **William Stewart,** superintendent of the foundry department of the same plant, resigned during the past month, and with Charles F. Conlon of Plainville, has organized the Plainville Casting Company, with a capital stock of $50,000.

Frederick P. Weston, president of the **Excelsior Needle, Standard and National Sweeper** plants of the **Torrington Company,** underwent an operation at the Charlotte Hungerford Hospital during the past month for the removal of internal ulcers. His condition is improving.

Francis H. Griffiths, treasurer of the **Turner & Seymour Manufacturing Company,** has been re-elected president of the **Torrington Y. M. C. A. Frederick L. Braman,** of the **Torrington Branch** of the **American Brass Company,** is first vice-president.

The Borgeson Manufacturing Company early in April closed its plant indefinitely, owing to business depression.

Torrington plants are still working on short time with greatly reduced forces, though there has been a slight improvement in conditions over last month.

Charles W. Davis, master mechanic at the Standard plant of the Torrington Company, and **Miss Hazel Mae Patten** were married April 16, in Trinity Church, Torrington.

The manufacturers of Torrington at a meeting on April 25, voted unanimously to set their clocks ahead one hour on Wednesday, April 27, to conform with the daylight saving plan. A state law had made it impossible for the borough to enact a daylight saving ordinance, but as a result of this action by the manufacturers, daylight saving was assured for Torrington. The business men, banks and schools changed their hours to conform with the new schedule.—S. H. T.

HARTFORD, CONN.

MAY 2, 1921.

As a result of announced reductions in the price of steel, Hartford's industrial leaders are almost unanimous in their belief that improved industrial conditions will be noted, and it is the general opinion that the steel reductions will act on other lines, bringing the entire metal trade down to more normal levels of business. "The whole metal trade has been waiting for Judge Gary to speak and his announcement, I believe, will prove to be the forerunner of similar action by considerable and varied interests," was the statement of **Samuel M. Stone,** vice-president of the **Colt's Patent Fire Arms Manufacturing Company,** who added that cheaper steel would act as a very potent stabilizer and would create new interest among buyers. A similar opinion was expressed by General Manager B. H. Blood, of the Pratt & Whitney Company.

"We will see resumption now in some lines which have cleaned out their stock of steel and were waiting for lower prices," was the statement of **R. K. Davis,** of the **S. K. F. Ball Bearing Company.**

Although the announcement was characterized at the **Hartford Machine Screw Company** factory as of far-reaching beneficial effects on the metal trades, it was said that they had not seen any reductions announced on steel bars and until these were also in the cheaper list their plant would not be affected directly.

By action of the common council of Hartford, appropriations of $5,000 at a time have been made for the purpose of providing municipal work for men unable to find other employment. Under the supervision of **George A. Parker,** superintendent of parks, a force of men, unable to find other work, have been engaged by the city, doing grading jobs, cutting wood and in other ways carrying out orders benefiting some municipal department. At one time, nearly 200 men were included on the special "unemployed payroll," earning enough to sustain their families until conditions are better.—W. A. L.

NEW BRITAIN, CONN.

MAY 2, 1921.

Nobody desires, at this time of great industrial depression, to be any more pessimistic than necessary, but facts compel the statement that conditions in New Britain have improved but slightly, if at all, and, in the opinion of some of he leading manufacturers, no considerable improvement is expected before summer or early fall and even then on a very gradual scale. The **Stanley Works,** one of the biggest of the local concerns and now affiliated with the **Stanley Rule & Level Company,** is averaging about 36 hours per week. A peculiar thing noted at this company, and the same thing is true at the **Landers, Frary & Clark Company** and other concerns, is that the order books show at least as many individual orders as ever and possibly from more individuals. However, as these orders are invariably for small lots, the gross sales are no larger, and seldom as large, as heretofore when a smaller group of purchasers was taking the output. This change obviously results in an added amount of office work. The **P. and F. Corbin** division of the **American Hardware Corporation** seems to be slowing down and reports from reliable sources indicate that the working time, in some departments at least, is to be further reduced to 32 hours per week. The

Fafnir Bearing Company, which has been closed down since last November, has not reopened on a full schedule, but a few orders sifting in now and then have given employment to a few hands, and has kept the machinery from getting rusty. The **North & Judd Manufacturing Company** and the **Traut & Hine Manufacturing Company** have but little different to report. Business is slow and is not showing many signs of picking up as yet.

However, shining brightly in this cloud of depression is a statement from **George P. Spear,** manager of the **Corbin Screw Corporation** of the **American Hardware Corporation** in which he announces that already three departments in his concern have been suddenly given considerable added work, to such an extent that each department has gone onto the full working schedule of 55 hours per week and has also taken in some new employes. The **New Britain Machine Company,** while still operating with a negligible force of employes, professes to see some signs of renewed business life. A statement from this concern says that business is picking up a little and in the tractor department some good orders are being received and several carload shipments have been either sent out or will be soon.

All in all, however, New Britain cannot look with any degree of optimism for a brisk resumption of business before next Fall.—F. J. H.

ROME, N. Y.

MAY 2, 1921.

Curtailed working schedules still prevail in the metal industry plants of this city, but conditions are gradually improving. A reduction of 20 per cent. in wages has been made in practically all of the shops in Rome. No labor trouble has resulted therefrom and none is anticipated, according to persons in close touch with the situation. It is understood that the **Rome Wire Company** is doing a nice business, considering business conditions in general. The **Rome Manufacturing plant** is turning out a good-sized supply of staples, while the **Rome Metallic Bedstead Company** is said to be increasing its working force to a marked degree. The **Rome Brass & Copper Company,** which furnishes material to the other plants, is correspondingly in active operation.—M. J. D.

PROVIDENCE, R. I.

MAY 2, 1921.

With the end of April, industrial and mercantile conditions in Rhode Island are declared to be more encouraging, generally speaking, than has been the case in nearly a year.

This is especially true in connection with the various branches of the metal trades. There is less unemployment than there has been for a number of months, and plants are operating on better time schedules, although there have been wage reductions in many instances. There are more orders reported on hand and in daily receipt than for a long time. On the whole there is a very optimistic spirit prevalent that makes the future appear far more hopeful.

While there is practically no structural work on new residential buildings, there is considerable repairing now being done, together with unusual activity on new business blocks that is giving the metal lines affiliated with the building trades a serviceable and satisfactory stimulation that is expected to continue until well into the Fall, at least.

Among the lines identified with the manufacturing jewelry industry, although by no means rushed as they should be under normal conditions at this particular season, a very material improvement is reported that is proving very encouraging to both the employers and employes. The sales forces are out among the wholesale and jobbing customers with their sample lines of new goods and the early returns indicate a fair volume of business.

Richard F. Sanderson, manager of the **Art Metal Company,** sailed about the middle of the past month from New York on the steamer *France* for a three months' trip to Europe combining business with pleasure. During his absence Mr. Sanderson contemplates visiting England, Spain, France, Holland, Italy and probably Germany.

The C. & G. Manufacturing Company has received a charter to conduct a jewelry business under the laws of Rhode Island. The business will be located in Providence and is capitalized at $18,000.

John P. Bonnett & Son have moved their Providence electroplating establishment from 140 Orange street to more commodious quarters at 85 Page street.

F. A. Watson, sheet metal worker, has removed his shop from 48 Truro street to 11 and 13 Barney street, Newport.

The Herman-Morris Company, Inc., has been chartered with a capital of $25,000 for the purpose of carrying on a general jewelry business.

The Whitestone Jewelry Company, of this city, has been incorporated with a capital of $25,000 for the purpose of conducting a general jewelry business.—W. H. M.

TRENTON, N. J.

MAY 2, 1921.

There is little change in the metal industry at the present time despite the fact that many manufacturers believed that business would begin to pick up by early Spring. At one plant the working hours were reduced and this is an indication that the hard times are here for a while at least. The big plant of the **Jordan L. Mott** company was being operated on a four-day-a-week basis. Then the business began to drop off again and the firm has been compelled to cut down the working time to three days a week. This applies in all the departments. The majority of the other plants are operating but three and four days a week, with the exception of the **Skillman Hardware Manufacturing Company.** The Skillman plant is being operated fifty hours a week and has been running on that basis all through the slump.

Vice-Chancellor Foster has appointed **Senator William H. Parry** as receiver for **The Rotacar Company,** of 354 Mulberry street, Newark, N. J. The company manufactures toy cars.

The Motor Signal and Accessory Company, of 74 Marshall street, Newark, N. J., has been chartered at Trenton with $150,000 capital to make motor signals.

The White Manufacturing Company, of Newark, N. J., has been chartered at Trenton with $50,000 capital.

Eastern Bronze Corporation, of Elizabeth, N. J., has been chartered at Trenton, N. J., with $600,000 capital to deal in various kinds of metals.

The New Jersey Electric Lamp and Glass Company, of 185 Market street, Newark, N. J., has been incorporated with $100,000 capital to manufacture electric lamps.

W. F. Howell Hardware Company, of Newton, N. J., has been chartered at Trenton with $50,000 capital.

The Kieckhefer Container Company has begun the erection of a large industrial plant at Thorn and Copewood avenues, Camden, N. J. The building will be of steel and will be 65 by 168 feet in size.

Independent Contact Manufacturing Company, of the town of Union, N. J., has been chartered at Trenton with $100,000 capital to make electrical contacts.

Robert H. Engle, the pioneer of the zinc industry in Trenton, N. J., who left five years ago, has returned to that town to make his home in the future. He is now proprietor of the Trenton Electro Laboratory on Hamilton avenue, Trenton, N. J., one of the finest laboratories of its kind in New Jersey, being specially equipped for metallurgical research work. Mr. Engle was the organizer of the Trenton Smelting & Refining Company and the M. M. S. Metal Company, of Trenton.

The affairs of the **Federal Machine Company,** a $10,000,000 New Jersey corporation, for which a receiver was sought, have been definitely taken out of court by the dismissal by **Vice-Chancellor Backes** of two bills of complaint filed against the concern, practically complete rehabilitation of the corporation having been achieved.—C. A. L.

BALTIMORE, MD.

MAY 2, 1921.

The present financial market has been responsible for the abandonment of plans by at least two metal industry corporations for building large plants in or around Baltimore.

One of these companies, a Western plumbing concern, several months ago decided to erect a plant here for the manufacture of brass and nickel appliances. The other company's plans fell flat owing to the failure of financial arrangements.

J. P. Kennedy, head of the **Kennedy Foundry Company,** resigned on April 8 as a member of the Maryland State Racing Commission. In his letter to Governor Ritchie, Mr. Kennedy stated that his business demanded all of his attention at the present time.

Rumors from quarters usually considered reliable and to the effect that the directors of the **Columbia Graphophone Company,** far from passing its preferred dividend, were considering the re-establishment of the common dividend, have circulated in the Baltimore financial district. The company has been unexpectedly successful in disposing of inventories as a result of an intensive selling campaign in the last few weeks, it was said, and the cash position materially improved.

The sheet metal business of **Charles T. Brandt,** located at 711 Columbia avenue, is to be removed this month to a new plant in the 1600 block of Ridgeley street, where a new building now under construction will have been completed.

Announcement has been made that the **Paragon Motor Car Company,** a $3,000,000 corporation, has decided to locate in Cumberland, Md., with **W. P. Blake** as president.

A 10 per cent cut in the wage scale of the **Baltimore Copper Smelting and Rolling Company** has become effective. **Charles N. Sappington,** superintendent of the plant, said that the reduction has affected between 800 and 900 employes.

Fire of unknown origin completely wrecked the plant of the **American Metal Company** in Baltimore on March 23. Officials of the company estimated the damage to be several thousand dollars.—W. J. L.

INDIANAPOLIS, IND.

MAY 2, 1921.

Dr. Charles Ambrey Eaton, editor of Leslie's Weekly, was the principal speaker at the fifteenth annual dinner and business meeting of the Indianapolis branch, **National Metal Trades Association,** recently in the Riley room of the Claypool hotel. He spoke on "The Real Labor Problem." Motion pictures will be shown and officers will be elected.

Articles of incorporation have been filed with the Secretary of State showing the organization of the **Putnam Alloy Company,** at Greencastle, Ind., with a capitalization of $50,000, for the purpose of manufacturing chemical elements and alloys. Directors of the company are, **David C. Hughes, George S. Harney** and **Glen O. Stringer.**

Notice was served recently on the employes of the **Columbus Foundry Company,** Columbus, Ind., of a 25 per cent. reduction in wages,, effective May 1. The union molders employed by the company were given until April 25 to make a reply to the reduction announcement. A few months ago the molders went on strike when the company attempted to put them on piece work, but an agreement was reached quickly. The present agreement under which the molders are working expires May 1. The company announced the reduction was being made in view of a reduction in the cost of living and to stimulate production.

Three men, charged with violating the picketing ordinance of Indianapolis by intimidatng employes of the **C. & G. Pattern Works,** and other pattern works in the city, were found guilty by Judge Pritchard and fined in City court recently.

The Dill Foundry Company, at Rushville, Ind., is having plans drawn for the construction of an addition to its plant. The new construction will house a pattern shop. The improvements will cost approximately $40,000.

Work has been started on the construction of a one story foundry building for the **C. & A. Potts Company,** of Indianapolis. The building will be 60 feet wide and 132 feet long and will be of brick and steel construction and will cost approximately $45,000.—E. B.

CLEVELAND, OHIO

MAY 2, 1921.

The immediate progress of the metal industry in Cleveland depends upon whether operatives in the construction industry here walk out on May 1, as a protest against a 20 per cent. reduction in wages. The impending strike, even though no hint of such has emanated from the headquarters of the union building trade workers, will be considered the direct outcome of a long drawn-out controversy between the Building Trades Council and the Building Trades Employers' Association over new agreements to be entered into on May 1. Employers contend cost of living has been lowered sufficiently to warrant a cut in wages, and workers contend there is no reduction in living costs. It seems that the latter are more nearly right than the employers, but that has not stopped the wage cut program.

The whole situation brings to the front more agitation for the open shop principle here, and this finds its reflection more closely in the metal industry in the adoption of resolutions by the Founders' Association of Cleveland, indorsing the stand for the open shop taken by stockholders of the United States Steel Corporation at New York on April 18. If this is a forecast of what is ahead here, 32 plants will be involved, where there are now but seven operating on open shop plan. If the lead is taken by the founders, most of which have operated closed shops through agreements with the International Molders' Union, it is expected to be followed by a general adoption of the principles in industry as a whole in this section of the state. When founders sought to operate upon an open shop plan and reduce wages from 90 cents to 75 cents, strikes were called, so that operations have been limited upon the old basis, but with fewer men employed. Many of the smaller brass foundries of the city also have adopted the open shop plan this spring, reducing wages and establishing the nine-hour day, but strikes were declared against these plants also. The importance of this open shop move may be realized when it is stated that Cleveland is one of the largest foundry centers in the country, having about 100 plants of all kinds, and employing normally close to 7,000 men.

Creditors representing $7,500,000 of the $9,500,000 in claims against the Standard Parts Company, which has been in receivership since September 12, have approved the reorganization plan made by C. S. Eaton, of Otis & Co., chairman of the reorganization committee. The plan proposes the creditors bid in the property at Receiver's Sale as far as their claims will permit, and that a new company be organized, with 125,000 shares of common stock of non-par value, $1,000 in ten shares of management preferred, and the issuance of $6,500,000 in mortgage notes due January 1, 1924.

A new automobile concern has been organized which will be known as the **Sterling-Knight Motor Company,** Cleveland, O., using the Knight sleeve valve motor. Production in the automobile industry here is in keeping with that throughout the country, upon a 60 per cent. basis now, compared with a 25 per cent. basis last January. It is important information for the metal industry, depending as it does largely upon automobile outlet, to announce that **Chandler, Cleveland, Stearns, Ford, Grant, Jordan** and **Templar** all are increasing production and hiring additional men weekly. Business men here are amazed at the revival in this trade, instead of in necessary lines, and are asking the question whether it will keep up. Some think not, and point to the fact that the **International Harvester** tractor plants will virtually shut down for the season on May 1.

Reflection of the labor uncertainty in this section is seen in the decision of the **Mullins Body Corporation,** maker of automobile bodies, to leave Salem, dismantle its plant there, and move to Detroit, where a plant has already been leased. Under normal conditions this plant has been employing 1,200 men, but employes refused to work nine hours a day, and this, combined with other difficulties, decided the move.—C. C. C.

DETROIT, MICH.

Business in general reports conditions considerably improved during the last several weeks, but up to a few days ago there has seemed to be little advancement, and in some cases a slight decline noted. However, determined efforts are being made in the automobile field to increase production as much as possible. None of the great plants are running to capac-

ity or near that point, but they are doing more now than many thought possible a few weeks ago. Outside the automobile business the outlook is not quite so encouraging. There is practically nothing doing in the manufacture of plumbers' supplies. Collections continue slow not only in the brass industry, but in every other line as well. Everybody seems to be buying just for immediate needs, which really is considered a good feature, as it prevents many concerns from over-stocking with something they are not sure will be needed in the immediate future. In other words, caution seems to be the watch word all along the line.

Many of the large manufacturers here seem to have changed their views as to the future, and think that there will be only a slow moderate trend upward for many months. Prosperity is not coming with a rush, they declare, and it will be a wonder if the coming Fall and Winter show much improvement over what conditions are now. From this attitude which seems so prevalent at present, it is generally expected that caution in everything will be the watch word for many months to come.

There's one gratifying feature that is pleasing to everyone, and that is the small number of failures among the larger concerns. Most of those who have had financial difficulties are the small concerns with limited capital. Most of these failures are those with resources of $5,000 and less.—F. J. H.

LOUISVILLE, KY.

MAY 2, 1921.

The general situation in the local coppersmith shops and general metal working industry is quiet. High labor and production costs, along with refusal of buyers to place orders on high markets, is resulting in a tug of war between capital and labor. Capital refuses to invest, and labor refuses to accept less, with the result that labor is only partly employed in the metal industry.

Tom Hines, of Hines & Ritchey and the **Standard Milk Machinery Company,** stated that his companies had not cut a salary, and did not expect to do any cutting until conditions reached a point where they could not get business or show a profit otherwise, and that when such a time came it would lop wages, but not before.

It is reported that excellent prospects for Mexican distillery projects have been hard hit by action of the Mexican government in prohibiting use of its own grain in production of alcoholic products; while movement of American grain would probably be restricted for alcoholic use if it started. The Mexican government has also put a tax of $4 a gallon on whisky.

The **Independent Brass Works** reports a few straggling orders and is operating at about fifty per cent of shop capacity, but is not at all busy.

Business with the **Vendome Copper & Brass Works** has held up fairly well, as the company has several departments, but as a whole, things have not been active.

The house of **Matt Corcoran & Company** has been getting a fair share of such business as has been going the rounds, but admits that until conditions settle a little, there will not be any real activity in the field.—A. W. W.

MONTREAL, CANADA

MAY 2, 1921.

There has been a slight increase in production over the past months of this year. The increase in production does not, however, seem to reflect any increase in demand, but seems rather a partial resumption of natural business after a spell of idleness in which they have allowed orders to increase, or withdrawals of instructions previously issued to discontinue shipments on old orders. Optimism is a nice state to dwell in, and it sometimes transpires that an optimistic attitude has a lot to do with encouraging others, with the result that a general improvement takes place. Most of the manufacturers have kept on their full staff with reduced hours, but some organizations refused to accept these terms, preferring to see some of their number dismissed. Others put up a notice that beginning with a certain date the wages would be reduced. All told, readjustment is the cause of all the unrest and unemployment. Prospective buyers do not want to buy if the price is coming down, and manufacturers do not want to stock up if the prices are going to be lower.

Toronto's Transportation Commission, which is to operate the street railway system when the city takes it over on September 1 next, has this week placed an order with the **Canada Car and Foundry Company,** of Montreal, for 100 motor street cars and sixty trailer cars. The contract price is $1,270,000. This contract had keen competition from the States and was awarded to the local concern. There is a large amount of brass used in their construction; they operate their own foundries and build the entire car. They also have prospects of closing some other large contracts in the near future.

The Garth Company, located on Craig street, are operating a full force in their factory, as they have large orders on hand for paper mill and pulp equipment for new concerns.—P. W. B.

BIRMINGHAM, ENGLAND

APRIL 25, 1921.

Bad as trade was a month ago it is very much worse now. A general strike of coal miners is now in its third week, and for the moment there is no certainty that a settlement will be reached by next week. The miners describe the situation as a lockout. The act for the cessation of government control of the industry came into operation on March 31. Notices had been given at all coal mines by the owners that reduced rates of wages would be paid as from that date. The reply of the miners was an instruction from the Miners' Federation that every man should cease work on March 31. Apart from the question of wages, the miners formulated a demand for the restoration of government control and a national pool with a view to a uniform system of wages. The employers, as they had done during the preliminary negotiations, which have been going on for some months, insisted that wages should be governed by district conditions. Efforts have been made by the government to bring the parties together, and a series of conferences has taken place.

Great hopes were entertained by the miners that they would have active support of the other two branches of what is known as the Triple Alliance, namely, the railwaymen and the transport workers. The Triple Alliance did in fact declare a strike to commence on the night of Tuesday, April 12. This was temporarily called off, but on Friday, April 15, it was fixed definitely for 10 o'clock that night. To the great relief of the whole country however, it was announced on Friday afternoon that the strike was cancelled. The miners have now been left to fight their battle alone. The reason assigned for the withdrawal of the Triple Alliance from the struggle is the insistence of the miners' executive upon their pooling proposal. Another reason, however, for the retreat of the Triple Alliance is undoubtedly the fact that a very large proportion of their constituents showed no disposition to join in the general strike.

The industrial dislocation already caused by the coal stoppage has put off, it is to be feared for a long period, the revival of trade for which there was some litt'e reason to hope. It has certainly rendered much more serious the existing depression. There is scarcely one brass foundry which is working more than three days a week, and a number will be closed should the coal strike continue another week.

Owing to the shortage of coal, the refining works of the Mond Nickel Company, at Clydach in Wales, will close this week, throwing out 800 men.

Reductions of wage rates continue to be proposed and though some of the workpeople are still standing out, especially in the engineering trades, there is a growing tendency to recognize the force of the economic argument. The negotiations in the brass trade have ended in a general reduction though not to the extent proposed by the employers, and a scheme has been adopted under which the rates will vary upwards or downwards at the rate of 1d per hour for each variation of 12½ points and ½d per hour for each variation of 6¼ points in the cost of living as indicated by the Board of Trade figures.—H.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The International Nickel Company, New York, announces the removal of its offices from 43 Exchange place to 67 Wall street.

The Zeller Lacquer Manufacturing Company has moved its offices to the Canadian Pacific building, Madison avenue and 43rd street, New York.

The Chicago Baling Press Manufacturing Company, have moved their office from 305 South La Salle street to 4842 West Kinzie street, Chicago.

The Ely Anode and Supply Company announces its removal to permanent quarters at No. 2 Rector street, from 61 Vesey street, New York, on May 1, 1921.

The fixed assets of the **W. A. Mills Brass Company,** Port Chester, N. Y., were sold to the Ham Boiler Corporation, who are now running an aluminum foundry under the name of the Port Chester Aluminum Company.

The Simmons Company, Kenosha, Wis., manufacturer of brass and iron beds, springs, etc., has filed plans for the construction of a two-story building for storage purposes, 120 x 182 ft., on Porter street, Baltimore, estimated to cost about $70,000.

The Great Western Smelting and Refining Company, announces the removal of its Cleveland, Ohio, office from 514 Hippodrome building to 108 Terminal building, 1200 West 9th street, Cleveland, Ohio, where its warehouse is also located.

The Bay State Stamping Company, Chandler and Walworth streets, Worcester, Mass., has acquired title to the land on which its plant stands, from the estate of John H. Bennett, who founded the business. Daniel W. Lincoln is now the president.

The Attwood Brass Works, 742 Front avenue, N. W., Grand Rapids, Mich., has been incorporated with a capital of $100,000 to manufacture brass, bronze and other metal products. The firm operates a brass machine shop, soldering, polishing, japanning and lacquering departments.

The Sundh Engineering and Machine Company, manufacturer of brass mill finishing machinery, announces the removal of its main office to the factory at 1105 Frankford avenue, Philadelphia, Pa. The former main office at the Otis building, 559 West 26th street, New York City, will be continued as a branch.

The Johnson Manufacturing Company, Inc., Fanville, Va., has been incorporated for $25,000, by J. A. Johnson, president, Danville; N. H. Hazlewood, secretary, Danville, and W. A. McCanless, South Boston; to manufacture and deal in articles of steel, copper, brass, tin and other metals. They are in the market for a machine for polishing small aluminum castings.

At the special meeting of stockholders called for April 22, 1921, at the office of the **National Conduit and Cable Company, Inc.,** Hastings-on-Hudson, N. Y., a quorum was not present, and the meeting was adjourned to the offices of the New York County Lawyers' Association, 165 Broadway, New York City, May 10, 1921, at 2 P. M. Proxies will be received until that date.

The Robertson & Brabook Mfg. Company, Taunton, Mass., has been incorporated with a capital of $33,000 by Charles J. Robertson, Leonard M. Brabook, J. Douglas Robertson, and others, to manufacture metal products, stove bolts, machine screws of standard sizes and special screw products, upset and roll-threaded. The departments are tool room and stamping department.

The Chapman Valve Manufacturing Company, Indian Orchard, Mass., is taking bids on a brick, concrete and steel, fireproof, 50 x 275-foot with two wings, each 20 x 275-foot, foundry. It will be equipped with annealing furnaces, pattern storage, sandblast and compressor rooms, etc. The company operates a bronze foundry, brass machine shop, tool room, grinding room and japanning shop.

The Evansville Electrical Manufacturing Company, Evansville, Ind., manufacturer of bronze bearings, trolley wheels, mine supplies, etc., whose plant has been in operation since last August, has been incorporated with $25,000 capital stock. John Polling, formerly with the Westinghouse Company, is president and George W. Powell, of the U. S. Bureau of Mines, vice president; William Bootz, secretary and H. A. Robertson, treasurer. The company operates a smelting and refining department, brass and bronze foundry, brass machine shop, and tool room. They are now in the market for shop equipment.

The Universal Bearing Bronze Company, Winsted, Conn., have reopened their plant after being closed since the first of the year. They operate a bronze and aluminum foundry, brass machine shop, tool room, grinding room, cutting-up shop, spinning, stamping, plating, polishing and lacquering departments. They are in the market for one power sprue-cutter, preferably second-hand in good condition that will cut ¾" brass.

The Newark Spinning and Stamping Company, 8 Division place, Newark, N. J., have filed notice of organization to manufacture metal products such as cuspidors, vase holders, candle-sticks, trays, automobile lamps, etc., which are spun out of copper, brass, aluminum, zinc, etc. The departments operated are spinning, stamping, brazing, soldering and polishing. Albert Stetz, 9 Tichenor Terrace, Irvington, is the head of the firm.

William D. Zilsky, Newark, has been granted permission to establish a factory for the Radium Aluminum Manufacturing Company, at 263-65 New York avenue for the manufacture of aluminum and other metal specialties, utilizing an existing structure. Provision is made that operations shall be conducted for one year only, at the end of which time the works are to be removed. They operate a tool room, spinning, stamping and polishing shop.

The Standard Metals Manufacturing Company, 1302 North Main street, Los Angeles, Calif., has been incorporated for $100,000, by Walter P. Story, H. D. Schroeder, the inventor of a new flush valve, and others, to manufacture this valve besides specialties of brass and copper. They have a modern factory 50 by 100 feet, with a capacity of 500 valves a week, and it is their intention to add a brass foundry and nickel plant to what they already have.

The International Nickel Company, 43 Exchange place, New York, has awarded a contract to the McClintic-Marshall Company, Oliver building, Pittsburgh, Pa., for the erection of its proposed new plant at Huntington, W. Va., for the manufacture of rolled nickel products. The plant will consist of a group of one-story buildings, approximating 200 x 400 feet in size, including rolling mill and other departments. It is estimated to cost in excess of $2,000,000 with machinery. Frank I. Ellis, Farmers' Bank building, Pittsburgh, is consulting engineer for the project.

The Electric Furnace Company, Alliance, Ohio, has just installed three Baily electric brass melting furnaces of different sizes and capacity, but built upon the same resistance principle. The Bagley and Sewall Company, Watertown, N. Y., has installed a 50 K.W. electric furnace with 500 pounds' hearth capacity, the Alliance Brass and Bronze Company, a 75 K.W. furnace with 800 pounds' capacity, and the Empire Brass Works, of London, Ontario, a 105 K.W. furnace of 1,500 pounds' hearth capacity. All of these furnaces are to melt yellow and red brass alloys. The Empire Brass Works is the fourth Canadian plant to adopt the Baily electric furnace for melting its non-ferrous metals.

STATISTICAL EXCHANGE INVESTIGATED

The Copper & Brass Statistical Exchange, under the direction of A. A. Ainsworth, 522—5th Avenue, New York, an organization for the collection of statistics concerning production, quantities and avenues of consumption, etc., is under investigation by the Lockwood legislative committee. Samuel Untermeyer, counsel for the committee is said to have asserted that it was one of a number of combinations to maintain prices at certain levels in violation of the Sherman act. Mr. Ainsworth stated that he had no comment to make for publication.

FOREIGN BRASS AND COPPER INDUSTRY

In the Argentine Republic, S. A., the demand for brass is very much less than for either iron or steel, the entire importations of brass and copper, including both pigs and sheets, averaging not over 600 tons per year. Aside from one foundry making water cocks and valves, the greater part of all brass castings are of an ornamental nature, such as busts, commemorative tablets, electric lighting fixtures, adornments for tombstones and bedsteads, and bank grill work. There is also one company making a very good line of builders' hardware, especially fancy door handles and lock plates. Aluminum castings are made only to replace broken parts, and the development of this phase of the metallurgical industry is likely to be very slow, as there are no factories requiring this material on a large scale.

In Austria the couuapse of the Monarchy, in October, 1918, abuot two-thirds of the brass factories, including the most important ones, were located in the territory of the present Austria. These factories employ at present approximately 4,000 people. Their capacity during the war rose to about eight times that of the pre-war period.

The union formed in 1918 was maintained after the dissolution of the Monarchy for the distribution of the brass stocks, which were for the most part in Austrian territory. These raw materials were available to manufacturers until May, 1919, and until that time the price of Austrian brass products was considerably lower than that of other countries. Since that time prices have tended rapidly to overtake the prices in other markets.

HELP FOR GOLD PRODUCERS

Representative Louis T. McFadden, chairman of the Banking and Currency Committee of the House of Representatives, introduced a bill to "conserve the gold ore resources of the nation, which are being wasted through the continued shutting down of the gold mines," by providing revenue from an excise of 50 cents per pennyweight of fine gold contained in manufactured articles, to be collected at the time of sale, and for a premium of 50 cents per pennyweight to be paid to the producers of newly mined gold in the United States and its possessions.

PLATINUM SUPPLY ASSURED

The United States Government is assured of an adequate supply of platinum in the event of another war through an arrangement with the South American Gold & Platinum Company.

The South American company is working the vast fields of Colombia, which are expected to yield 50,000 ounces this year and double that amount in 1922.

The South American company is controlled by the Lewisohn Exploration Company which is American owned, and by Johnson, Matthey & Company, a British concern.

WORKERS TO PREVENT WAR

A world agreement of metal workers to prevent war by refusing to manufacture munitions is urged in a letter by William H. Johnston, president of the International Association of Machinists, addressed to the Federation of Metal Workers at Berne, Switzerland.

The federation was urged to call a world conference for that purpose, it was announced, in accordance with a resolution adopted last September by the machinists' convention at Rochester.

EASTWOOD WILL

By the will of John H. Eastwood, of the Eastwood Wire Manufacturing Company of Belleville, N. J., Calvin H. Neally, vice-president and general manager, has secured a controlling interest in the concern. Thirteen years ago Mr. Neally came to the Eastwood company from the New York office of the International Paper Company, where he was assistant manager of purchasing. His rise since then to his present position is a romance of business. The Eastwood company, which is perhaps the largest manufacturer of Fourdrinier wire in the world, manufactures brass fittings. The value of the stock holdings which Mr. Neally acquires under the will of Mr. Eastwood is unofficially estimated as upward of $1,000,000.

AVIATOR WITH METAL JOINTS

Captain Nungesser, the French Ace, who arrived in this country recently, has a record of bringing down forty-three enemy planes in flames and forcing down forty more machines.

Although he had been wounded seventeen times and has a platinum lower jaw, a platinum knee and a foot made of the same metal, he looked perfectly sound as he walked down the gangway.

Nungesser, who is 29 years old, comes as the guest of the Aero Club of America, and was met at the pier by a delegation of the members, and while here he will introduce to the Government-owned or private concerns certain inventions he has perfected. One of them is a balloon, but he declined to give any further details.

ORDERED TO DIVEST STOCK

The Federal Trade Commission on March 9, 1921, ordered the Aluminum Company of America to divest itself in good faith of all stock in the Aluminum Rolling Mill Company of Cleveland, O., within one year, on the ground that the law against unlawful restraints and monopolies had been violated.

TRADE PUBLICATIONS

Volta Electric Furnaces.—A catalog of electric furnaces and electric furnace equipment for ferrous and non-ferrous melting, manufactured by the Volta Manufacturing Company, Ltd., Welland, Ont., Canada.

Wealth from Waste.—A catalog of baling and briquetting presses, manufactured by the Chicago Baling Press Manufacturing Company, Chicago, Ill.

Curtis Steam Turbines.—Bulletin No. 42201-B. A catalog issued by the General Electric Company, Schenectady, N. Y., describing and illustrating Curtis steam turbines, 100 KW. to 3,500 KW. capacity.

Zinc Spouting.—A pamphlet issued by the New Jersey Zinc Company, 160 Front street, New York City, setting forth advantages of using zinc for roofing, gutters, leaders, etc.

Commercial Possibilities of the Union of South Africa.—A pamphlet issued by the National Foreign Trade Council, who have assembled and summarized this material in brief, in order to bring to the attention of American exporters a few of the most suggestive facts bearing on conditions in South Africa. It may be obtained free, on request, from O. K. Davis, secretary, National Foreign Trade Council, 1 Hanover Square, New York City.

Research Narratives No. 7. Making Explosions Beneficial. Research as a Sociological Factor.—A folder issued by the Engineering Foundation, 29 West Thirty-ninth street, New York.

Lacquer Enamels.—A folder issued by Maas & Waldstein, 92 William street, New York, containing a color chart of their lacquer enamels.

Oil and Gas Burners.—Bulletin No. 223, issued by the W. S. Rockwell Company, 50 Church street, New York, describing and illustrating various types of burners for the use of oil and gas fuels for industrial heating.

Transportation, the Problem of Soft Coal.—A pamphlet issued by the National Coal Association, Washington, D. C., setting forth the necessity of keeping coal steadily moving in order to meet the needs of the nation.

The Industrial Fellowships of the Mellon Institute, 1921.—The eighth annual report by Raymond F. Bacon, director of the Mellon Institute of Industrial Research of the University of Pittsburgh, Pittsburgh, Pa.

Match Plates.—A folder issued by the St. Louis Machine Tool Company, 932 Loughborough avenue, St. Louis, Mo., describing their steel and aluminum match plates. Another folder issued by the same firm describes their core boxes and Arcade modern molding machine.

The New "Push-On" Attachment.—A folder issued by the Gustave Fox Company, 411 Race street, Cincinnati, Ohio, illustrating their "Push-On" name-plate for automobiles, and also their line name-plates, medals, badges, etc.

Karma.—A folder issued by the Electrical Alloy Company, Morristown, N. J., describing their new Karma resistance wire for electrical elements.

The Research Information Service of the National Research Council.—A pamphlet issued by the National Research Council, Washington, D. C.

The Engineering Foundation, Report for the Year Ended February 10, 1921.—Issued by the Engineering Foundation of the United Engineering Society, 29 West Thirty-ninth street, New York.

The Wire Drawing Industry.—A paper on the history of wire drawing, by Kenneth B. Lewis, of the Morgan Construction Company, Worcester, Mass., read to the employees of that company December 20, 1920.

Research Narratives No. 5 and No. 6, on the Early Use of Nickel and an Ammonia Gas Story.—Folders issued by the Engineering Foundation, Inc., 29 W. 39th street, New York, telling five-minute stories about the development of the knowledge of these topics.

La France Safety Devices.—A folder issued by the American La-France Fire Engine Company, Inc., Elmira, N. Y., illustrating and describing their various safety devices.

Chesapeake Electric Traveling Cranes.—A folder issued by the Chesapeake Iron Works, Baltimore, Md., illustrating and describing their exhibit at the Exposition of the American Foundrymen's Association, Columbus, Ohio, October 4-8, 1920.

Thomas Register of American Manufacturers.—Published by the Thomas Publishing Company, 129 Lafayette street, New York.

It is stated that over 200,000 changes will appear in the new edition of this manufacturers' register, and over $300,000 has been spent in correcting, bringing up-to-date, and in making this work as nearly accurate and complete as is humanly possible.

Northern Cranes.—Catalog No. 28, issued by the Northern Engineering Works, Detroit, Mich. A catalog on electric traveling cranes.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$500	$600
American Brass	100	170	178
American Hardware Corp.	100	136	—
Bristol Brass	25	15	20
International Nickel, com.	25	16	16⅛
International Nickel, pfd.	100	82	85
International Silver, com.	100	28	—
International Silver, pfd.	100	92	—
New Jersey Zinc	100	123	126
Rome Brass & Copper	100	125	140
Scoville Mfg. Co.	100	315	340
Yale & Towne Mfg. Co.	—	240	250

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

COPPER

Home consumption of copper in April is estimated to have been about 60,000,000 pounds, or about equal to the monthly average during first quarter. Deliveries, however, were 70,000,000 pounds, due to the holding back of deliveries previously contracted for. Exports were close to 1,500 tons (33,600,000 pounds) but full returns are not yet available. Total deliveries, therefore, into both domestic and foreign consumption were between 100,000,000 and 110,000,000 pounds. These figures are close to the aggregate of sales made by producers to domestic and foreign consumers.

Domestic production, last month, was close to 80,000,000 pounds and imports are estimated to have been 20,000,000 pounds. The indication, therefore, is that there was no increase in surplus stocks held by producers during April. Substantial reductions from now, forward, are expected as a result of the closing down of properties responsible for about three-fourths of total output in this country, Mexico, and in South America.

Prices of copper suffered some reduction during the month, on prompt deliveries. Lake deliveries opened 13.00c and at the close was held 12.75-13.00c Electrolytic f. o. b. refinery opened 12.87½c and closed 12.37½c-12.50c while casting copper f. o. b. producer's works, on April 1, was 12.00c and on April 30 was 11.62½c per pound. There was a firmer and more confident feeling among producers during the closing week of the month, due to the improved statistical position, however, rather than to the commercial position. Demand, throughout the month, was largely for May and June shipments and prices of future positions ruled ⅛c to ¼c per pound higher than prices for prompt.

TIN

Price fluctuations in the April tin market covered a range of 3½c per pound on Straits metal and 3c per pound on American pure and on 99% tin, from the lowest level established April 5th, to the highest level on April 25th. The result of fluctuations was a net advance of 2⅝c per pound on spot Straits from 29c at the beginning of the month to 31.87½c at the close; 2¼c per pound on American pure from 29c to 31.25c and 2⅛c on 99% tins from 27.87½c to 30.50c at the close. Consumption of tin in this country, according to an authority, notwithstanding manufacturing operations have been low, has been above an average of 1,600 tons per month as shown by statistics covering first quarter, 1921. The outlook for future business is undoubtedly more promising, although rapid improvement is not to be expected. It is believed, however, that the tide has certainly turned. Tin at present levels is cheap and while dealers and operators have been and still are, the principal buyers, consuming interests, with returning confidence in the generally improved business situation, will be wanting tin, but inevitably, when demand improves, it will not be possible to buy the metal at present prices, notwithstanding the large supplies held by the Governments of the Federated Malay States and the Netherlands. Net arrivals during April were 555 tons. Stocks on hand and landing amounted to 2,341 tons, of which 100 tons were landing.

LEAD

The April market for lead, closed strong and firm at advanced prices in both markets, the leading interest quoting 4.50c per pound (after two advances made April 26th and 28th), this being an advance of ¼c per pound from the opening. The outside market closed 4.50c East St. Louis, 4.65-4.75c New York for prompt and May with June held at a premium of five points. After the opening in the outside market, 4.25-4.35c East St. Louis, 4.45-4.50c New York, (the March closing) consuming demand continued steady and in fair volume until about the middle of the month, when, due to the quieter market condition, some irregularity in prices was developed in the West, and quotations receded to the lowest level April 19th, 4.20-4.25c per pound. In New York, where supplies were not too large, outside prices were stationary after the opening until April 20th, when the trade in anticipation of the expected tariff increase upon importations, took a more confident view of the situation. Supplies in the East had not been increased, and on April 22nd, a gradual rise in prices was begun which continued almost daily, thereafter until the close.

ZINC

The April zinc market, like April lead, closed firm and at an advance of 35 points over opening prices both in East St. Louis and in New York quotations which were 5.00c in the West, and 5.50c New York for prompt and May primary. June was held 5.05c East St. Louis, 5.55c New York. After the opening at March closing, 4.65c East St. Louis, 5.15c New York prices were unchanged until April 12th, when it became known that March production was 3,000 tons in excess of shipments, resulting in an increase of stocks in smelter's hands. Prices immediately declined to the lowest level of the month, 4.60c East St. Louis, 5.12½c New York, being still based upon importations from abroad, but by April 20th, there having been fairly active buying in the meantime, prices had recovered five points. The tariff

prospect now became a strengthening factor and with the continued active demand and better general situation developing, the advance was continued daily until April 28th, when the market turned quiet at the highest level of the month, 5.00c East St. Louis, 5.50c New York, these figures remaining at the close.

ALUMINUM

Prices of aluminum in both the outside market and the schedule of the Aluminum Co. of America, remained unchanged throughout April. Quotations of the only producer, subject to daily conditions, f. o. b. producer's plant in 15-ton lots were 28.50c OOD and purer, 28c 98-99% virgin ingots, 27.30c No. 12 alloy and 42.60c sheet 18 gauge. Outside quotations were 23.00-23.50c OIHOOD virgin ingots, 20-21cOIHOOD remelted and 19-20c No. 12 remelted. A better demand from the automobile trade for both sheet and ingots was an encouraging feature during first fortnight and later, the generally expressed feeling was that the worst was over. Gradual improvement is expected. Representatives of the industry on April 8th, discussed tariff rates on imported ores and manufactures of the metal before the Ways and Means Committee but no decision has yet been announced. European market prices were reported firmer with some holders asking ½c per pound, in view of the greater confidence which was felt in regard to the future.

ANTIMONY

The antimony market in April showed marked improvement in consuming demand, with greater interest in shipments from the Orient. Prices after opening at 5.12½c duty paid spot carloads, the March closing, were unchanged until April 25th, when there was an advance of ⅛c per pound due to the continued buying, small in volume, which had taken place in the meantime. Demand continued fair after the advance which had carried to 5.25c for spot carloads, duty paid New York. Jobbing lots were held ¼c to ½c per pound premium, according to quantity. Owing to a break in Pacific connections, Orient prices for shipment offerings were held up, but bids were being freely made at 4.50c in bond.

SILVER

April fluctuations in the price of bar silver of foreign origin covered a range of 6¾c per ounce from the lowest level, 56⅛c per ounce, on April 1st, to the highest level 62⅞c April 12th. With the closing made at 60⅞c per ounce, however, there was a net advance of but 4¾c per ounce. The price of domestic bars pegged at 99½c per ounce by the Pittman Act, was quoted 99¼c per ounce, on and after April 25th, due to the necessity of making all deliveries at Denver, by order of the Director of the Mint—freight rates absorbing the other ¼c per ounce. Total exports of silver, according to U. S. Chamber of Commerce Statistics, during February, 1921, amounted to $5,336,880. Importations during February amounted to $4,862,121 indicating an excess of exports over imports amounting to $474,759.

QUICKSILVER

The April market opened $45-47 bid and asked for flasks of 75 pounds each, the same as the March closing. Fluctuations carried to $48 bid and asked, April 20th, but with increased supplies coming in receded to $46-47 per flask April 29th, with no further change at the end of the month. Thus, there was a net advance of $1.00 per flask. Exports of quicksilver, according to U. S. Commerce Statistics, in February, amounted to 1,495 pounds valued at $988 as compared with exports in February 1920 when exports were 23,974 pounds valued at $26.643.

PLATINUM

Steady business, light in volume was noted in April with prices unchanged at the March closing, $70-75 per Troy ounce for pure, until April 21st, when asking prices were advanced to $72 per ounce. Quotations over the remainder of the month were $72-75 bid and asked. Total importations in February were 5,631 Troy ounces valued $372,609. Of the total received, 4,043 ounces were in unmanufactured form, 1,598 ounces were ingot, bars, plates, etc., and 10 ounces were vases, retorts, etc., for chemical uses. Exports of unmanufactured were 354 ounces.

OLD METALS

Sentiment in the old metals market at the end of April was distinctly improved over that prevailing at the end of March. Expectancy of better conditions was based upon more frequent inquiries from consumers, although sales were still difficult to make, particularly in brass and copper scrap. Lead, however, was advanced by the leading interest in the major market, (10c per 100 lbs.)—a very small advance to be sure, but the old metals trade felt and responded quickly to the change. Copper, tin and lead, all became firmer. Prices changes registered advances for the month as follows: 2c to 23c on block tin pipe; 1c to 16c on No. 1 pewter; ½c each on aluminum clippings to 12.50c; on strictly crucibled copper to 10c and on uncrucibled copper to 8.75c; ¼ per pound each on light copper to 7.25c; on composition scrap to 8.25c; on No. 1 composition turnings to 7.00c; heavy lead to 3.75c; tea lead to 2.50c and electrotype to 3.75c. Declines registered were ½c each on new type shell cuttings to 5.50c; special heavy to 6.50 and new brass to 5.50c. ¼c declines were on brass turnings to 4.75c and clean red car boxes to 7.00c.

APRIL MOVEMENT IN METALS

	Highest	Lowest	Average
Copper:			
Lake	13.00	12.75	12.875
Electrolytic	12.87½	12.37½	12.375
Casting	12.00	11.62½	11.815
Tin	32.25	28.75	30.411
Lead	4.75	4.50	4.561
Zinc (brass special) St. Louis	5.12½	4.75	4.868
Antimony	5.25	5.12½	5.155
Aluminum	23.50	23.00	23.25
Quicksilver (per flask)	48.00	45.00	47.00
Silver (cts. per oz.) Foreign	62.87½	56.12½	59.336

WATERBURY AVERAGE

Lake Copper, Average for 1920, 18.06. 1921, January, 13.75—February, 13.50.—March, 12.625.—April, 12.75.

Brass Mill Zinc, Average for 1920, 8.33. 1921. January, 6.05—February, 5.50.—March, 5.25.—April, 5.20.

Metal Prices, May 9, 1921

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.	
Manufactured 5 per centum.	
Electrolytic, carload lots, delivered	12¾-13
Lake, carload lots, delivered	13
Casting, carload lots, delivered	11¾
TIN—Duty free.	
Straits, carload lots	31⅞
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.75
ZINC—Duty 15%.	
Brass Special	5.60
Prime Western, carload lots	5.45
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb., f. o. b. factory	....
Ton lots, f.o. b. factory	23-28½
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot.	5.25
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	44.00
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained	....
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25-$1.35
BISMUTH—Duty free	1.59
CADMIUM—Duty free	1.40
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained	....
COBALT—97% pure Nominal	4.00
QUICKSILVER—Duty 10% per flask of 75 pounds	46.00
PLATINUM—Duty free, per ounce	72.00-75.00
SILVER—Government assay—Duty free, per ounce	.99¼
GOLD—Duty free, per ounce	20.67

Metal Prices, May 9, 1921

INGOT METALS

Silicon Copper, 10%	according	to	quantity	36	to42
Phosphor Copper, guaranteed 15%	"	"	"	17	to33
Phosphor Copper, guaranteed 10%	"	"	"	16	to32
Manganese Copper, 30%	"	"	"	50	to56
Phosphor Tin, guarantee 5%	"	"	"	40½	to50½
Phosphor Tin no guarantee	"	"	"	35	to45
Brass Ingot, Yellow	"	"	"	8½	to11⅞
Brass Ingots, Red	"	"	"	12	to14.85
Bronze Ingot	"	"	"	13¾	to16½
Parsons Manganese Bronze Ingots	"	"	"	16	to19
Manganese Bronze Castings	"	"	"	27	to36
Manganese Bronze Ingots	"	"	"	13	to16
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	23½	to25½
Monel Metal	"	"	"	38	

OLD METALS

Buying Prices		Selling Prices
9½to 9¾	Heavy Cut Copper	11 to12
8½to 9	Copper Wire	10 to11
7½to 8	Light Copper	9 to 9½
9½to10	Heavy Machine Comp	11½to12
6 to 6½	Heavy Brass	8 to 8½
4 to 4½	Light Brass	6 to 6½
5 to 5½	No. 1 Yellow Brass Turnings	6½to 7
8½to 9	No. 1 Comp. Turnings	10 to10½
3½	Heavy Lead	4
3½	Zinc Scrap	4
6½to 9½	Scrap Aluminum, Turnings	7½to10½
15½to17½	Scrap Aluminum, cast alloyed	18.00to19.50
18.50	Scrap Aluminum, sheet (new)	21.00
25.50	No. 1 Pewter	29.50
14½	Old Nickel anodes	16½
22½to24½	Old Nickel	26½to28½

BRASS MATERIAL—MILL SHIPMENTS

In effect March 10, 1921,
To customers who buy 5,000 lbs. or more in one order.

	High Brass.	Low Brass.	Bronze.
	Net base per lb.		
Sheet	$0.17¼	$0.19¼	$0.21
Wire	.18¼	.20¼	.22
Rod	.15¼	.20¼	.22
Brazed tubing	.29	..	.34¼
Open seam tubing	.29	..	.34¼
Angles and channels	.34	..	.39¼

To customers who buy less than 5,000 lbs. in one order.

	High Brass.	Low Brass.	Bronze.
	Net base per lb.		
Sheet	$0.18½	$0.20½	$0.22¼
Wire	.19½	.21½	.23¼
Rod	.16½	.21½	.23¼
Brazed tubing	.30¼	..	.35½
Open seam tubing	.30¼	..	.35½
Angles and channels	.35¼	..	.40½

SEAMLESS TUBING

Brass, 21c to 22c. per lb. base.
Copper, 22c. to 23c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19¾c.	net base
Muntz or Yellow Metal Sheathing (14"x48")	17¼c.	" "
Muntz or Yellow Rectangular Sheets other than Sheathing	18¼c.	" "
Muntz or Yellow Metal Rod	15¼c	" "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20.½c.-22¾c.	net base
From stock	22c. -26c.	net base

BARE COPPER WIRE—CARLOAD LOTS

15¼c. to 16¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	21¼c. per lb. base
100 lbs. to 300 lbs. in one order	22¼c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 11c. basis less 8 per cent. discount.

Casks, jobbers' prices	12½-13c.
Open casks, jobbers' prices	13-13½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	42½c.
Aluminum coils, 24 ga. and heavier, base price	37½c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	30¾c. per lb.
15% "	33¼c. " "
18% "	34c. " "

Nickel Silver Wire and Rod

10% Quality	33c. per lb.
15% "	37¼c. " "
18% "	40c. " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 60c. to 62c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 62c to 65c.

NICKEL ANODES

85 to 87% purity	.50c. per lb.
90 to 92% "	.52½c. per lb.
95 to 97% "	.55c. per lb.

Supply Prices, May 9, 1921

CHEMICALS

In Commercial Quantities

Acid—		
Boric (Boracic) Crystals	lb.	.17
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.07½
Nitric, 42 deg. Carboys	lb.	.07¾
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured	gal.	.65
Alum—		
Lump, Barrels	lb.	.05
Powdered, Barrels	lb.	.06
Aluminum sulphate, commercial tech	lb.	.03-.05
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.75
Argols, white, see Cream of Tartar	lb.	.80
Arsenic, white, Kegs	lb.	.09
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Calcium Carbonate (Precipitated Chalk)	lb.	.07
Borax Crystals (Sodium Biborate), Barrels	lb.	.07½
Carbon Bisulphide, Drums	lb.	.10
Chrome Green	lb.	.40-.45
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.26
Cyanide	lb.	.63
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.34
Crocus	lb.	.15
Dextrin	lb.	.10
Emery Flour	lb.	.07
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.47-.50
Salts, single, bbls	lb.	.12-.13
Salts, double, bbl	lb.	.14-.15
Paraffin	lb.	.10
Phosphorus—Duty free, according to quantity		.30-.35
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.07
Electrolytic, 70-75% fused	lb.	.10
Potassium Bichromate, casks	lb.	.14
Carbonate, 80-85%, casks	lb.	.07
Cyanide, 100 lb. drums, 94-96%	lb.	.50
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07½
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.39
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax, bbls	lb.	.07½
Bisulphite, tech. bbls	lb.	.05¾
Cyanide, 96 to 98%, 100 lbs	lb.	.27-.30
Hydrate (Caustic Soda) bbls	lb.	.05½
Hyposulphite, kegs	lb.	.05
Nitrate, tech. bbls	lb.	.04½
Phosphate, tech., bbls	lb.	.0[illegible]
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.75
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12
Sulphur (Brimstone) bbls	lb.	.03
Tin Chloride	lb.	.40
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.70
Yellow, No. 1	lb.	.30
Whiting, Bolted	lb.	.06
Zinc, Carbonate, bbls	lb.	.20
Chloride, 600 lb. lots	lb.	.12
Cyanide	lb.	.46
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$32.10
14 " 20 " 64/68, "	"	39.95
12 " 20 " 84/92, "	"	45.85
14 " 20 " 84/92, "	"	61.75
Sewed buffs, per pound		
Bleached and unbleached	"	.65

FELT WHEELS

Less Than 100 Lbs.

		Price Per Lb.
White Spanish—		
Diameter— 6" to over 16"	Thickness—½" and ¾"	$4.00
" 6"	" 1" to 3"	3.10
" 10" to 16"	" 1" to 3"	3.00
" over 16"	" 1" to 3"	3.10
" 6" to over 16"	" over 3"	3.40
Grey Mexican or French Grey—		
Diameter— 6" to over 16"	Thickness—½" and ¾"	$3.90
" 6"	" 1" to 3"	3.00
" 10" to 16"	" 1" to 3"	2.90
" over 16"	" 1" to 3"	3.00
" 6" to over 16"	" over 3"	3.30

Above are even diameters. Odd diameters 50c advance.